CIBSE JOURNAL

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July 2023 www.cibsejournal.com

CIBSE PRESIDENT ADRIAN CATCHPOLE ON LEADERSHIP

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CIBSE Journal is written and produced by CPL (Cambridge Publishers Ltd) Tel: +44 (0)1223 378000.
www.cpl.co.uk
1 Cambridge Technopark, Newmarket Road, Cambridge CB5 8PB.
Editorial copy deadline: First day of the month preceding the publication month

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Fit for the future

Incoming CIBSE President Adrian Catchpole FCIBSE means business. In his inaugural address, he announced three new initiatives aimed at tackling some of the biggest challenges facing the industry: the skills shortage, inappropriate value engineering, and meeting the requirements of the Building Safety Act.

To encourage more young people into the industry, Catchpole launched a STEM Ambassador scheme that uses data to match a school's requirements with the skills of volunteer CIBSE Members.

He is challenging each CIBSE region to create 10 STEM Ambassadors during his presidential year, which would mean more than 200 new advocates for the industry promoting science, technology, engineering and maths in our schools.

The Building Safety Act will transform the industry for the better as it forces everyone in the supply chain to be accountable for their role in a building's delivery. For CIBSE Members, this means proving they are competent to design, build and maintain buildings. CIBSE's new Chartered Organisation Programme, announced by Catchpole, will enable organisations to show they are competent, professional, ethical and committed to developing qualified staff. Catchpole predicts it will become a badge of quality that will help companies to differentiate themselves.

To meet the future criteria being developed by the Net Zero Carbon Buildings Standard, the industry must change its procurement processes, says Catchpole, who is already talking to other institutions, including RIBA, RICS and iStructE, about the inclusion of building performance metrics, testing and post-contract evaluations. Catchpole wants to see a fundamental review of value engineering so that it is focused on building performance, whole life operating costs, carbon assessments, maintenance and building safety.

Value engineering was also the topic at a debate sponsored by Geberit (page 28). While one panellist saw value engineering still being used as an excuse for cost cutting, others involved in larger projects said clients are increasingly interested in value engineering with higher-standard products. CIBSE's Hywel Davies said the trend would accelerate when competency regulations in the Building Safety Act come into force. He argued that anyone substituting a product would have to demonstrate it complied and had the same performance as the original. Similarly, if a design is changed, it would have to be proven that the designer is competent and had private indemnity insurance.

The panel concluded that genuine value engineering would only be achieved with early engagement, collaboration, and a focus on operational outcomes.

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CONTRIBUTORS

Hywel Davies
Outlining the major conclusions of the *Testing for a safer future* review of construction products testing

Ana Santos
Aecom's principal health engineer joins the debate on how value engineering can focus on quality and not just cost

Alex Shan
Why communal spaces are important and how technological innovation and data will drive change

Tim Dwyer
This month's CPD module looks at the performance optimisation of wintertime MVHR solutions

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The official magazine of the Chartered Institution of Building Services Engineers

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 ISSN 1759-846X

SUBSCRIPTION ENQUIRIES
If you are not a CIBSE member but would like to receive *CIBSE Journal*, subscribe now! Costs are £80 (UK) and £100 (international). For subscription enquiries, and any change of address information, please contact Nicola Hurley at **nhurley@cibse.org** or telephone **+44 (0)208 772 3697**. Individual copies are also available at a cost of £7 per copy, plus postage.

CIBSE Journal, ISSN 1759-846X (USPS 4070) is published monthly by CPL, 1 Cambridge Technopark, Newmarket Road, Cambridge CB5 8PB, UK.

Subscription records are maintained at CIBSE, 222 Balham High Road, London, SW12 9BS, UK.

ISSN 1759-846X (print)
ISSN 2756-1895 (online)

CREDITS
Cover and P20-23 Credit / Lyons with Silver Thomas Hanley, Officer Woods, The Fulcrum Agency and Aspect Studios. Photographer: John Gollings P07 Shutterstock / Rupert Rivett P10 Shutterstock / VV Shots P14 Credit / © Morley von Sternberg P28-31 Credit / Jessica Marsh P33 Shutterstock / APChanel P37 Shutterstock / Lev radin P38 Shutterstock / Corona Borealis Studio / John Crux P41 Shutterstock / Dinko Dumancic P49 Credit / © Art Gallery of New South Wales, Jenni Carter P61 iStock.com / PhotoMavenStock P62 iStock.com / Intpro

ABC audited circulation: 18,724 January to December 2021
Printed by: Warners Midlands PLC

British satellite to map energy efficiency of UK homes

A new British satellite launched on one of Elon Musk's rockets earlier this month will enable the energy efficiency of the UK's building stock to be mapped from space.

SatVu, based in Guildford, said its Hotsat-1 thermal imaging satellite achieved lift off with SpaceX Falcon 9 on 13 June. Hotsat-1 maps the heat being generated from buildings, and is the first of a constellation of eight satellites that is planned.

SatVu says the 'unprecedented level of detail and scale' offered by the satellite's aerial thermal imaging technique will allow local authorities to target buildings in need of retrofitting and insulation. It will have the resolution to see individual rooftops and walls.

Applications are expected to include monitoring the effects of heat islands and industrial processes, waterway pollution, ensuring energy efficiency, and assessing the health of solar farms. SatVu expects to receive the first images in July.

Growing wildfire risk poses air quality health threat

Wildfire smoke can affect indoor air quality hundreds miles of away

Experts have warned that the growing risk from wildfire smoke will have an increasing impact on global health, as climate change brings record temperatures and more intense heatwaves across the world – including the UK.

With indoor air quality affected by airborne fine particles and gaseous substances, mitigation measures around ventilation should increasingly be considered for buildings in at-risk areas, according to members of the UK's Airbods research group (see article, 'Protecting buildings from wildfire smoke', on page 37).

A UN Environment Programme report predicts an increase of up to 50% in wildfires across the globe by the end of the century, and serious incidents can affect air quality in urban areas thousands of kilometres away. Smoke from wildfires in Canada, for example, triggered health alerts across American cities last month, as air quality deteriorated. Millions of people in areas including New York City were advised to wear high-grade masks outdoors to combat the effects of the hazardous smoke. Individuals most at risk include young children, the elderly, and those with heart or lung problems.

In the UK, June brought the first heatwave of the summer, with temperatures between 25°C and 28°C for three days. The prolonged heat triggered a number of wildfires, including a 300-acre blaze on Rhigos mountain in Rhondda Cynon Taf county, Wales.

The Met Office forecasts temperatures this summer will reach similar highs to last year's records. On 19 July, the hottest day of 2022, more than 800 fires were recorded as the mercury rose above 40°C for first time in the UK. .


Sir Keir Starmer has pledged to end 'sticking plaster' approach to energy

Starmer: we will decarbonise electricity by 2030

Labour Party's green plan aims to streamline renewables planning process

Sir Keir Starmer has pledged to 'throw everything' at Labour's goal to decarbonise UK electricity generation by 2030 if the party wins the next election.

In a speech in Edinburgh last month, the opposition leader launched the party's 'national mission' on clean energy. Pledging to end what he described as the current government's 'sticking plaster' approach to energy, Sir Keir said: 'We're going to throw everything at this: planning reform, procurement, long-term finance, R&D, a strategic plan for skills and supply chains, a new plan for a new settlement, a clear direction across all four nations, pulling together for a simple, unifying priority. British power for British jobs.'

Labour also announced that, in the first months after it comes to power, it would carry out its pledge to scrap the government's de facto planning ban on onshore wind farms.

In addition, the party's Green Prosperity Plan outlines steps to cut the length of the planning process for renewables projects from 'years to months' and end the 'duplication and bureaucracy' in the process for getting offshore wind consent.

Labour said it would ensure every relevant regulator has a net zero mandate, while requiring local authorities to identify areas suitable for renewable generation.

Sir Keir used his speech to announce that Great British Energy, the publicly owned company that it wants to set up to kickstart investment in low carbon sources, will be based in Scotland.

His speech follows an earlier announcement by shadow chancellor of the exchequer Rachel Reeves that the party would not implement its pledge to increase green investment to £28bn per year immediately if it forms the next government.

Government decarbonisation plans lack coherence, says committee

The government has no overarching plan to decarbonise the power sector by 2035, according to MPs on the Public Accounts Committee (PAC).

In a report published last month, the PAC said it was 'sceptical that expansion plans for nuclear, solar and wind are credible, and unconvinced the private sector has enough clarity to provide investment'. While the government had many separate ongoing power decarbonisation plans, it added, its ambitions are jeopardised by the lack of an integrated and coherent delivery plan.

The committee's report says the government needs to publish a plan by autumn 2023 'at the latest' and it calls for annual progress plans to be shared. In addition, the government's delivery plan should explain what impact decarbonising power will have on consumers' bills. The government estimates that up to £400bn of public and private investment in new generating capacity will be needed by 2037, but the PAC is unconvinced the private sector has been given enough clarity to invest confidently.

Dame Meg Hillier MP, chair of the Committee, said: 'There is an information vacuum in key areas – energy efficiency, investment, the cost of the transition to the public – that must be addressed. We need an overarching plan charting the way.'

IN BRIEF

Sector demands planning reform

A joint letter to the Prime Minister has called on the government to reform England's planning system to bring it into line with the Climate Change and Environment Acts.

More than 100 signatories from across the built environment sector are supporting urgent amendments to the Levelling-up and Regeneration Bill currently going through parliament. They include Aecom, Atelier Ten, Atkins, Buro Happold, Hoare Lea, Max Fordham and Troup Bywaters + Anders.

Louise Hutchins, UK Green Building Council's head of policy and public affairs, said: 'By introducing a clear legal imperative for planning decisions at all levels, to align with our Climate Change and Environment Acts, we can unlock huge investment and momentum towards low carbon infrastructure.'

Labour reveals plans to buy more land

The Labour Party has announced plans to give local authorities new powers to buy land cheaply and develop on it.

Sources have briefed that, if elected next year, the party will pass a new law to allow officials to buy land under compulsory purchase orders without having to factor in the 'hope value' – a premium granted to land based on what it may be worth once it has received planning permission.

Getting rid of hope value would free up more cash for infrastructure to serve sites and other benefits, such as affordable housing.

New research facility is carbon neutral

The National Manufacturing Institute Scotland, operated by the University of Strathclyde, has opened its flagship facility in Renfrewshire's Advanced Manufacturing Innovation District Scotland.

Designed by HLM Architects, with building services by Davie + McCulloch, the 11,500m^2 campus next to Glasgow Airport is operationally carbon neutral, and will support manufacturing, engineering and associated technology businesses of all sizes.

It features a large-scale rooftop solar array and has access to a state-of-the-art low carbon district heating network.

IN BRIEF

Heat pump owners happy with their buy

A big majority of owners are satisfied with their heat pump, but less confident than boiler users about controlling their devices, according to a new survey.

A poll of nearly 3,500 boiler and heat pump users across Britain, carried out by Eunomia Research and Consulting for innovation agency Nesta, found that home owners who use heat pumps are 'highly satisfied' that they are 'safe, reliable, quiet heat sources that are effective for space heating and producing hot water'.

More heat pump owners (67%) than gas boiler owners (59%) were satisfied with running costs, and heat pump satisfaction is just as high in older properties, which are often seen as hard to retrofit.

However, heat pump owners were less happy about use and control of their heating. More than a fifth (22%) felt 'not very' or 'not at all' confident about controlling their heating compared with 6% using a gas boiler.

Vegetable oil boilers offer cost benefits

Converting kerosene boilers to run on vegetable oil is cheaper than installing heat pumps, a trial in an off-grid Cornish village has shown.

Boilers in 17 homes, a church and school buildings in Kehelland were converted to use hydrotreated vegetable oil fuel over 18 months.

Oil heating trade bodies UKIFDA and OFTEC, which ran the trial, said the average cost of converting the boilers was £500 per property, and the trial resulted in an 88% drop in emissions.

Engineers must lead on net zero, says CIBSE President

New incumbent launches key initiatives during his presidential address

Engineers have never been more needed to provide creative solutions to the challenges presented by climate change and building safety, according to CIBSE's new president Adrian Catchpole.

In his presidential address at the CIBSE AGM, Catchpole highlighted the need to deliver an 'urgent' response to the challenges. He told his audience at the Royal Society: 'We must help move the built environment from being a significant contributor to global emissions to being an exemplar of how to reduce them. Each one of us needs to step out of our comfort zone... and commit to "taking a lead".'

Adrian Catchpole, left, and Kevin Mitchell

Catchpole, who succeeds Kevin Mitchell as CIBSE President, announced initiatives aimed at attracting young people to the industry, improving engineers' competencies, and increasing collaboration across industry.

He launched a STEM Ambassador Scheme to match engineers with secondary schools and a new CIBSE Chartered Organisation Programme that will enable organisations to demonstrate competence. Catchpole also highlighted CIBSE's lead role in developing the UK Net Zero Carbon Buildings Standard.

● Read an interview with Catchpole on page 18.

Blending hydrogen is 'wrong approach'

A new briefing paper by the E3G think-tank has warned that blending hydrogen into the UK's gas grid is the 'wrong approach' and could increase household gas bills by up to 20%.

In March, the government's hydrogen champion Jane Toogood urged ministers to make a strategic decision by the end of this year to allow hydrogen to be blended into the gas transmission network so it can be used in home heating.

However, E3G's briefing warns that blending risks locking in hydrogen for 'inefficient uses' such as domestic heating at the expense of other sectors, such as heavy industry and storage for power generation, where it is the primary decarbonisation option. It also risks delaying strategic choices, such as slowing down the decommissioning of the gas network infrastructure, the paper warns.

The briefing repeats earlier warnings by E3G that the lower energy density per unit volume of hydrogen compared with gas means consumer bills could increase by between 7% and 20% because of difficulties metering a mix of the two. This also means a 20% blend could lead to only a 7% reduction in emissions – and only if the hydrogen is produced from renewable electricity.

PARKLIFE RETURNS TO CENTRAL MANCHESTER

Buro Happold is working with developer U+I to regenerate a 24-acre, formerly derelict, area of central Manchester. The Mayfield Regeneration is being built around the city's first new public park in more than a century, covering 6.5-acres on the banks of the River Medlock. The project, on a former railway depot, includes 1,500 homes and 154,800m² of office space, plus restaurants, bars and entertainment venues. Read more about biodiverse development on page 24.

Net zero consultation reveals performance benchmarks

Views are sought on proposals for the Net Zero Carbon Buildings Standard

The team shaping the UK's first Net Zero Carbon Buildings Standard (NZCBS) has announced a consultation on its Technical Update.

This will feed into the update, which will describe the technical fundamentals that will sit behind the NZCBS. The update is focused on the operational energy and embodied carbon performance levels for new buildings.

Operational energy and embodied carbon performance levels have been established to provide evidence of what can be achieved by individual sectors. For a detached house, for example, the proposed annual energy use for today's best practice detached home is 40kWh·m^{-2}GIA/yr with space heating at 20.

The data also reveals median and best-practice performance benchmarks for existing buildings and the embodied carbon performance levels of 571 projects assessed by the NZCBS team.

The mean figure for embodied carbon A1-A5 emissions in homes is 574, which is close to the mean for buildings across all sectors.

Technical steering group member and CIBSE head of net zero Julie Godefroy said: 'Please do engage with our consultation so we can refine our approach, identify areas of consensus and priorities for further work, and set a robust, but ambitious standard.'

In the call for evidence earlier this year, data was received on 3,800 buildings across the UK.

Key areas for consultation

Achievability of bottom-up levels of performance for new buildings
Operational energy and embodied carbon performance levels have been established, which provide technical evidence of what can be achieved by individual sectors, based on benchmarking, case studies and modelling. The focus of the consultation is to review these new-build operational energy and embodied carbon performance levels, which will be used to inform the limits and targets in the next stage of work on the standard.

Fundamentals and metrics
The consultation documents outline the main metrics that will be used in the standard, and set out the context for how these will be used.

Top-down available energy and carbon budgets
The consultation provides an update on the method by which carbon and energy budgets are calculated and downscaled.

The project team has now re-opened the call for evidence for embodied carbon data, to gather as much information as possible across all sectors.

A webinar on the consultation is taking place at 12pm on Monday 10 July, and the deadline for responses is Thursday 31 August. The webinar and consultation can be accessed at **www.nzcbuildings.co.uk**

IN BRIEF

Cooper recognised for services to lift and escalator engineering

The CEO of LECS UK, Dave Cooper FCIBSE, has been made an MBE for services to lift and escalator engineering in the King's Birthday Honours list.

Cooper, who was elected to the CIBSE Board at the annual AGM last month, has been in the lift industry for 43 years and is an Honorary Fellow at the University of Northampton.

He was awarded the CIBSE Silver Medal and is chair of trustees for the Lift and Escalator Educational Trust, which organises the annual Lift and Escalator Symposium, established in 2011.

Construction output fell 0.6% in April

After two consecutive months of growth, construction output fell 0.6% in April, according to the Office for National Statistics (ONS).

The ONS figures also reveal that materials prices rose 8.4% in the first four months of the year, with inflation levels at 4.7% in April.

Across the three months to April 2023, construction output increased by 1.6% compared with the previous three-month period.

A 3% fall in private housebuilding output and a 5.7% fall in private housing repair and maintenance contributed to the April decline in construction output.

Lords' coal mines change set to be axed

The government is planning to remove a House of Lords amendment to the Energy Bill banning new coal mines in the UK.

Liberal Democrat Lord Teverson introduced the amendment after the government gave a green light for a new mine to be built in Whitehaven, Cumbria.

The government plans to remove the amendment from the bill at committee stage before it reaches a vote in the House of Commons.

It also intends to drop measures inserted by the House of Lords that would enable small community energy projects to sell electricity directly to local consumers.

IN BRIEF

Interest rates hit 5% after 13 monthly rises

The Bank of England has hiked the base interest rate by 0.5%, to 5%, a bigger rise than anticipated before the announcement on 22 June. It is the 13th month in a row that rates have been increased and follows new official statistics showing inflation remained at 8.7% in May.

Professor Forster takes the chair on CCC

The Climate Change Committee (CCC) has appointed Piers Forster as its interim chair. The professor of physical climate change at the University of Leeds has served alongside current chair Lord Deben since 2018. He will remain in the role until a permanent chair is appointed. The CCC has also announced a new chief economist, Dr James Richardson, who has the same role at the National Infrastructure Commission.

GLA launches roof retrofit strategy to keep London cool

New report recommends more reflective roofs and solar PVs

A 'cool roofs' retrofit programme should be launched to minimise urban heat islands in the capital, says a new Greater London Authority (GLA) report.

Recommendations in last month's *GLA roofs designed to cool* include the establishment, by the GLA, of a Cool Roofs Retrofit Programme.

There should also be a Cool Roofs Retrofit Taskforce to help deliver the long-term objective of increasing the rollout of more reflective roofs and solar photovoltaics (PVs) across the capital.

In addition, this taskforce should be responsible for ensuring alignment of cool-roof activities with wider retrofitting efforts and programmes being promoted by the GLA.

The report says the benefits of reflective roofs include reduced summertime overheating in London and an overall reduction in energy use in air conditioned buildings.

The programme could make an 'important difference' in city-wide efforts to reduce London's urban heat island.

It could also prioritise the rollout of cool roofs in areas where there is the greatest heat exposure and vulnerability to heat stress, ensuring that those most in need are helped.

This report presents opportunity maps for where cool roofs should be installed, highlighting areas where high exposure, vulnerability and social inequalities overlap.

Combined with battery storage, PVs can reduce peak strain on the grid, the report adds.

It says a pilot scheme could integrate existing retrofit projects to determine whether a cool roofs component could be added, such as when comprehensive improvement and upgrade works could include improvements to the roof.


Blackfriars Bridge has 6,000m² of solar PVs

UK and US engineer mutual recognition deal

UK and US engineers look set to be able to work more easily in one another's countries after efforts to agree a mutual recognition agreement for engineering were kickstarted by the Atlantic Declaration, signed during Prime Minister Rishi Sunak's two-day visit to Washington DC.

Trade discussions between Sunak and President Joe Biden last month resulted in the 'Atlantic Declaration for a Twenty-First Century US-UK Economic Partnership'.

Following the signing of the declaration, the US's National Council of Examiners for Engineering and Surveying and the UK's Engineering Council began work to develop a mutual recognition agreement. This will provide a more direct path for licensed engineers to practice in each other's country. More information will be shared as it becomes available.

Sunak made a reference to the mooted UK-US mutual recognition agreement for engineering in his speech at the White House press conference that concluded his trade discussions in Washington.

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IN BRIEF


Kristina Allison

Awards recognise leading lighters

The Society of Light and Lighting presented awards following its AGM and president's address.

The SLL Leon Gaster Award was given to Yukio Akashi, Yuta Kuno, Kaori Murakami, Masaru Inatani and Tomoe Aoki, for the paper *Readability model of letters with various letter size, luminance contrast and adaptation luminance level for seniors*.

The SLL Walsh Weston Award went to Janne Askola, Petri Kärhä, Hans Baumgartner, Santeri Porrasmaa and Erkki Ikonen, for the paper *Effect of adaptive control on the LED street luminaire lifetime and on the life-cycle costs of a lighting installation*. The papers can be found in the *LR&T Journal*.

Chris Dicks was presented with the SLL Regional Award for his contribution to the CIBSE Home Counties North West Region, while the SLL Lighting Award was given to Bob Bohannon and Kristina Allison for their work on TM66.

Mark Ridler was awarded an SLL Honorary Fellowship for his significant contribution to the wider profession, and there were SLL President's Medals for Sharon Stammers and Martin Lupton, for their significant and lifetime contribution to lighting.

CIBSE Certification passes audit

CIBSE Certification successfully completed an unplanned audit by the Department for Levelling Up, Housing and Communities.

The auditors' said the scheme is well-structured, with a solid database and ongoing efforts to establish smart rules that could benefit other scheme providers. They noted that CIBSE Certification requires energy assessors to register as CIBSE Certification Low Carbon Consultants, qualifying them to analyse complex buildings.

Email **epc@cibsecertification.org** or visit **www.cibsecertification.org**

New president at the helm for the SLL

Helen Loomes shares her journey into a career in lighting in her inaugural address

Helen Loomes FSLL was inaugurated as the new president of the Society of Light and Lighting (SLL) at the SLL AGM in May, taking over from Andrew Bissell.

During her address, Loomes shared her journey into a career in lighting, starting at Holophane, before undertaking her City & Guilds in Illuminating Engineering and Lighting Technology. While there, her lecturer was David Loe, SLL past president. He shared his passion for lighting and continued to mentor Loomes throughout her career.


Helen Loomes is made president of the SLL

Loomes has a lifelong passion for learning, as demonstrated by her involvement and support for ongoing research relating to the non-visual effects of light – or, more specifically, human-centric lighting.

However, in the face of the ongoing climate crisis, she called for renewed focus on sustainable lighting and the need to create a circular economy for the lighting industry.

Building on recent work on SLL guidance on creating a circular economy in the lighting industry (TM66), the latest research in *Lighting Research & Technology Journal* (LR&T), and case studies, Loomes expressed her excitement for the upcoming Light2Perform conference, taking place as part of CIBSE's Build2Perform Live on 5-6 December 2023 at London ExCel (**bit.ly/CJL2P23**).

She acknowledged the work of immediate past president, Andrew Bissell, and past presidents Ruth Kelly Waskett and Bob Bohannon, along with the Society's executive committee and council, and the Society's VP group, who work together to ensure continuity and shared goals between the Society's leadership team.

● **Read Loomes' presidential address at bit.ly/CJSLLad23**

CIBSE Awards open for entries

The CIBSE Building Performance Awards 2024 are now open for entries.

Attracting the most forward-thinking professionals and organisations in the industry, the awards not only recognise outstanding projects and individuals, but also inspire others to push boundaries and drive positive change within the built environment.

They demonstrate what can be achieved in practice by those who are developing strategies for refurbishment and energy-efficient operation of existing buildings, designing new buildings that operate more effectively, and developing the products and systems that support them.

The CIBSE Building Performance Awards are the only ones to showcase the performance of buildings in use, and they feature categories that cover a wide spectrum of building-related disciplines, including: energy management; building performance consultancy; project design; and product innovation.

The categories reflect emerging trends and challenges in the industry, ensuring that the awards remain at the forefront of innovation and excellence.

The deadline for entries is 5 September 2023 and the CIBSE Building Performance Awards event will be at the Park Plaza Westminster Bridge hotel, London, on 29 February 2024.

● **For more information, the full list of categories, entry criteria, and submission details, visit www.cibse.org/bpa.**

The new CIBSE Board: from front row left to right: Vince Arnold, Kevin Mitchell, Adrian Catchpole, Les Copeland, Ruth Kelly Waskett, Laura Mansel-Thomas, Lionel James, Mike Burton, Mark Walker and David Stevens

Leadership focus for President as CIBSE Board is announced

President Adrian Catchpole urges engineers to take a lead to create change

New CIBSE President Adrian Catchpole FCIBSE has called for engineering leadership after succeeding Kevin Mitchell FCIBSE at the Institution's AGM on 13 June. In his presidential address, *Taking a lead*, Catchpole outlined the challenges of climate change and building safety (see page 18).

To attract young people to engineering, he announced a CIBSE STEM Ambassador Scheme (see story, right) and a CIBSE Chartered Organisation Programme that will facilitate the demonstration of industry competence. Catchpole said he was also meeting professional bodies to discuss how to improve industry collaboration and procurement.

The AGM saw the announcement of the new CIBSE Board. Fiona Cousins FCIBSE is CIBSE president-elect, and the new officers and Board members are:

- Immediate past-president **Kevin Mitchell FCIBSE**
- Vice-president: **Les Copeland FCIBSE**
- Vice-president: **David Cooper FCIBSE**
- Vice-president: **Laura Mansel-Thomas FCIBSE**
- Hon treasurer: **Vince Arnold FCIBSE**
- Board members: **Mike Burton FCIBSE, Lionel James MCIBSE, Ruth Kelly Waskett FSLL, David Stevens FCIBSE, Mark Walker FCIBSE.**

More details at **cibse.org/board**. The AGM minutes will be published in August's *Journal*.

Updated guide for sports lighting

A revised guide focusing on lighting for sports has been published. *LG4: Sports lighting* replaces the version published in 2006.

The updated guide takes note of new and emerging sports that are played in the UK that were not included in the 2006 guide, as well as proposed amendments to BS EN 12193. This guide is based only on the use of light-emitting diode (LED) light sources.

The requirements and recommendations give specific information on good lighting practice for each sport. Tabulated lighting parameters are provided for each sport's application relative to the new system of lighting classes.

The revised guide is now in four parts: Principles of lighting with respect to sport; Specific lighting requirements for individual sports (indoor and outdoor); Maintenance and operation of sports lighting; and Specification of equipment for sports lighting.

The aim is to create design flexibility while achieving basic lighting requirements for each sport.

LG4 is now available in the CIBSE Knowledge Portal at **www.cibse.org/knowledge**

LG4 covers lighting for many different sports

IN BRIEF

CIBSE President launches STEM Ambassador scheme

During his presidential address, *Taking a lead*, at the CIBSE annual general meeting on 13 June, Adrian Catchpole FCIBSE announced a partnership with STEM Learning to launch the CIBSE STEM Ambassador scheme.

UK-based members of CIBSE can register as ambassadors via STEM Learning, and volunteer in their area to promote building services engineering in local schools and colleges.

Catchpole has set a target for every CIBSE region to create 10 STEM Ambassadors during his Presidential year.

- Find out more at **cibse.org/STEM**

Support to upgrade your membership

If you are planning to upgrade your membership this year, CIBSE offers a wide range of application guidance and support services.

You can book a place on the membership webinars in July. These short sessions are led by a CIBSE membership expert and cover the application routes available for Associate (ACIBSE) and Member (MCIBSE) grade, and the assessment process.

There are also brief Q&A sessions at the end.

For help with your Engineering Practice Report, consult the range of sample reports available or book a premium report review.

If you are interested in becoming a CIBSE Fellow, you can request a recording from the June webinar titled *Your journey to CIBSE Fellowship (FCIBSE)*.

- For more details, email **membership@cibse.org**.

Call for *Guide B1: Heating* volunteers

CIBSE Knowledge is seeking volunteers to assist with reviewing and revising *Guide B1: Heating*, focusing on sizing and system selection.

If you would like to be involved, please email **knowledge@cibse.org**.

New members, fellows and associates

FELLOWS

Aspinall, Paul
Crewe, United Kingdom

Barker, Graham
Bradford, United Kingdom

Burgon, Peter Jack
Knebworth, United Kingdom

Chong, Wang Hei Bruce
Kowloon, Hong Kong

Chow, Wai Yip
Hong Kong, Hong Kong

Gough, Larry Jonathan
Somersham, United Kingdom

Hill, Alexander David
Gravesend, United Kingdom

Kwan, Chris
Kowloon, Hong Kong

Merritt, Richard Alexander
Bushey, United Kingdom

MEMBER

Ahmed, Lubna
Dubai, United Arab Emirates

Al-Musawi, Mohammed
London, United Kingdom

Alaraishy, Ahmed
Cairo, Egypt

Allcock, Jack
Leigh, United Kingdom

Berry, Andrew
London, United Kingdom

Brennan, Eugene
Dublin, Ireland

Brown, Daniel
Henfield, United Kingdom

Cao, Jun
London, United Kingdom

Chamberlain, Adam Richard
Seaford, United Kingdom

Chan, Ka Wang
Hong Kong, Hong Kong

Chan, Hon Pan
Tseung Kwan, Hong Kong

Chan, Hau Wing Kayley
Tseung Kwan, Hong Kong

Cheng, Chi Ngong
North Point, Hong Kong

Chiang, Cheung Lung
Lai Chi Kok, Hong Kong

Choi, Chong Shing
Tai Wai, Hong Kong

Chong, Wen Jie Sunny
Singapore, Republic of Singapore

Chow, Lap Yan Ryan
Hong Kong, Hong Kong

Christie, Alan
Hatton, United Kingdom

Chui, Wai Kit
Tuen Mun, Hong Kong

Chuttoo, Luv Sharma
Triolet, Mauritius

Coffey, Robert
Belfast, United Kingdom

Da Silva Costa, Maria Gabriela
Maidenhead, United Kingdom

Dagnini, Edoardo
London, United Kingdom

Daniel, Barrie
London, United Kingdom

Daniel, Luke Graham
Keighley, United Kingdom

Diamantopoulos, Georgios
London, United Kingdom

Emil, Fady
Hawally, Kuwait

Ferris, James Edward
Downpatrick, United Kingdom

Fox, Oliver
London, United Kingdom

Ghavabesh, Mohammad Sharif
Edinburgh, United Kingdom

Gugliotta, Serena
London, United Kingdom

Hancock, Jonathan
West Molesey, United Kingdom

Hartnett, John
Northampton, United Kingdom

He, Yuxuan
Kowloon City, Hong Kong

Heelas, Ian Edward
Beverley, United Kingdom

Ho, Kwan Ho
Kowloon, Hong Kong

Hon, Yik Lung
Kowloon, Hong Kong

Inacio, Luis
Entroncamento, Portugal

Ip, Tik Laam
Kowloon, Hong Kong

Khan, Yasser Ali
Dubai, United Arab Emirates

Knights, Raymond Christian
Rothwell, United Kingdom

Kwok, Tsz Wah
Kowloon, Hong Kong

Lam, Chun Kong
Hong Kong, Hong Kong

Lam, Hon Sum
Hong Kong, Hong Kong

Lau, Chun Wai
Hong Kong, Hong Kong

Lee, Tsz Sing
Hong Kong, Hong Kong

Lee, Kwan Ling Queenie
Hong Kong, Hong Kong

Leung, Lai Kin
Hong Kong, Hong Kong

Leung, Yik Ning
Kwai Fong, Hong Kong

Leung, Kin Bong Marco
Hong Kong, Hong Kong

Li, Yee Ting
Harborne, United Kingdom

Lui, Man Lung
Tseung Kwa , Hong Kong

Lyness, Robert
Belfast, United Kingdom

MacGugan, Ross
Bromborough, United Kingdom

MacInnes, Rohan
Cairns, Australia

Man, Kit Edmond
Hong Kong, Hong Kong

Mather, Matthew
Fareham, United Kingdom

McCarthy, Jonathan
London, United Kingdom

Mellor, Luke
Leicester, United Kingdom

Mok, Tan Wa
Tseung Kwan, Hong Kong

Mungrah, Sharda
Camp de Masque, Mauritius

Ng, Ka Ki
Hong Kong, Hong Kong

Nugent, Lawrence
Tunbridge Wells, United Kingdom

O'Reilly, Brendan
Greystones, Ireland

Puckering, Andrew James
Norton, United Kingdom

Reader, Christopher
Northampton, United Kingdom

Rees, Adam
Bryntirion, United Kingdom

Robertson, David John
Manchester, United Kingdom

Rose, Thomas
Sheffield, United Kingdom

Rusnak, Juraj
Poole, United Kingdom

Salehin, Zia
London, United Kingdom

Shah, Paras
Stevenage, United Kingdom

Tam, Weng Kei
Kowloon, Hong Kong

Thwaites, Gavin Lee
Crewe, United Kingdom

Tighe, Andrew Kenneth
Hamilton, United Kingdom

Tonner, Robert
Galashiels, United Kingdom

Turnbull, Laurie
Crieff, United Kingdom

Twomey, Richard
London, United Kingdom

Walsh, Bryan
Dublin, Ireland

Watson, Jack
Newcastle upon Tyne, United Kingdom

Wickramasundara, D. G. Nipun
London, United Kingdom

Williamson, Lawrence
Leeds, United Kingdom

Wong, Hon Wing
Tuen Mun, Hong Kong

Wong, Wing Yee Winnie
Hong Kong, Hong Kong

Wong, Kam Chuen
Hong Kong, Hong Kong

Yee, Ray
Paraparaumu, New Zealand

Yehezkel, Rachel
Camberwell, United Kingdom

Yeung, Kam Fai
Kowloon Bay, Hong Kong

Yung, Tak Fui
Siu Sai Wan, Hong Kong

Zhang, Kuo
Hong Kong, Hong Kong

Zhang, Yang
Hong Kong, Hong Kong

Zuccarella, Veronica
Glasgow, United Kingdom

ASSOCIATE

Aidek, Shamel
Rossendale, United Kingdom

Brown, Jake
Darlington, United Kingdom

Evans, Maxwell
Swindon, United Kingdom

Halliday, Joseph
London, United Kingdom

Hawken, Sophie
Newquay, United Kingdom

Hodgson, Kane
Dartford, United Kingdom

Hynes, Joseph
Manchester, United Kingdom

Littlewort, Thomas
London, United Kingdom

Minhas, Muhammad Azam
Plymouth, United Kingdom

Morgan, Alistair
Darlington, United Kingdom

O'Brien, Terry
Woburn sands, United Kingdom

O'Keefe, Gavin
Liverpool, United Kingdom

Roberts, Frank
York, United Kingdom

Shipp, Hayden
Bedford, United Kingdom

Wagstaff, Isabelle Louise
Sheffield, United Kingdom

Ward, Aidan
Sunderland, United Kingdom

Webster, James Gerald
Dunstable, United Kingdom

Whitbread, Megan
Longfield, United Kingdom

LICENTIATE

Acosta, Alex
Newark, United Kingdom

Aybar, Mark
London, United Kingdom

Azad, Joti
Kent, United Kingdom

Bourn, Adam
Birmingham, United Kingdom

Clutten, Jacob
Longframlington, United Kingdom

Comerford, William
Bristo, United Kingdom

Dean, James
Birmingham, United Kingdom

Fisk, Thomas
Billericay, United Kingdom

Fletcher, Charles
Coleshill, United Kingdom

Gardner, Callum
Birmingham, United Kingdom

George, Jikky
Muscat, Oman

Gotrel, Louis
Tewkesbury, United Kingdom

Hardcastle, Jake
Bradford, United Kingdom

Hendrick, John
Leatherhead, United Kingdom

Kennedy, Steven
Wythenshawe, United Kingdom

Litvak, Ester
London, United Kingdom

Marsh, Neil Anthony
Staines, United Kingdom

Melville, Alexander
Birmingham, United Kingdom

Newman, Kelvin
Brighton, United Kingdom

O'Donovan, Niamh
Manchester, United Kingdom

Oakley, Luke
Solihull, United Kingdom

Pillai, Ashok
Dubai, United Arab Emirates

Prakash, Ash
Birmingham, United Kingdom

Rose, Mark
Bury st Edmunds, United Kingdom

StClair, Michael
Manchester, United Kingdom

Tantari, Ivan
London, United Kingdom

Wyer, Danny
Fakenham, United Kingdom

Patrick Bellew looks back for Fellows' masterclass

Atelier Ten founder and chairman will discuss his influences and inspirations

The CIBSE Fellows Network is hosting a masterclass event with Patrick Bellew FCIBSE on 4 July, titled *Environmental engineering masterclass – 40 years of moving the dial*.

Bellew is founder and chairman of international design consultancy Atelier Ten, which he set up at the age of 30 and which now has more than 350 staff in 11 offices. It has become synonymous with high-performance integrated building design and sustainability.

Bellew also teaches at the Architecture School at Yale, where he is a visiting professor, influencing and inspiring a new generation of young architects.

During the masterclass, he will describe the people and things that have influenced and inspired him, and how he has dealt with innovation and risk.

Patrick Bellew FCIBSE

He will also discuss the development of the language and communication of environmental design that is the hallmark of Atelier Ten's success.

The event, in London, is open to CIBSE Fellows, who are encouraged to bring a guest to learn about the CIBSE Fellows Network.

● Register at **bit.ly/CJJul23CN1**

CIBSE to deliver joint session at building moisture conference

The CIBSE Health and Wellbeing Working Group and the UK Centre for Moisture in Buildings (UKCMB) will deliver a joint seminar on the retrofit of buildings and moisture management at the 2nd International Conference on Moisture in Buildings.

At the conference, industry experts, thought leaders and academics will explore strategies to enhance energy efficiency, improve indoor air quality, and ensure structural integrity, all with a focus on effective moisture management. Sessions will be followed by panel discussions so attendees can ask the speakers questions and talk about best practices, innovative solutions, and the future of building retrofit and moisture management.

The CIBSE/UKCMB seminar, at UCL at Here East on 3 July, will be chaired by Dr Hywel Davies, CIBSE chief technical officer, and Dr Marcella Ucci, of UCL. For the full list of speakers, and to register for the session, visit **bit.ly/CJJul23CN2**

● Find out more about the conference at **bit.ly/CJJul23CN3**

Testing times

A report into product testing and certification raises interesting questions for manufacturers in relation to building safety. Hywel Davies considers how they will need to demonstrate their products conform to standards

We are moving rapidly into a new era in construction. With the Building Safety Act, and the package of regulations implementing it, now emerging, we are seeing the greatest shake-up in the built environment since the Blitz. This column has previously considered the impact for designers and contractors, but there are also serious implications for the construction products sector.

A key tenet of the new regime is the responsibility of dutyholders for the work they do, whatever building work they do. There will be a new set of dutyholder roles for clients, designers and contractors, and legally described duties, with significant scope for the new Building Safety Regulator (BSR) to hold them accountable for their actions, or lack of them.

The new roles address one of Dame Judith Hackitt's findings in her 2018 report – a systemic lack of clarity on roles and responsibilities, and of accountability across the sector. So, clients will have to 'take all reasonable steps to ensure that those they employ are competent', as draft regulations issued in November 2021 put it. We expect the final version to be published very soon.

In turn, the principal designer and principal contractor will be responsible to the client, and accountable to the regulator, for the compliance of their design and construction activity with all relevant regulations. Communications from the BSR have been very clear: the onus is on dutyholders to provide evidence to support their own assessment that the building or buildings are fully compliant with the regulations. This will take the form of plans of the work and other relevant evidence that convinces the building control body that what has been designed, if built, will be compliant – and, once built, to demonstrate clearly that it really is compliant in its finished form.

Manufacturers might ask what this means for them. A great deal. Building Regulations set performance requirements to be satisfied and are supported by guidance indicating what a compliant solution could be. They often reference requirements to comply with a product standard or meet a certain level of performance.

"Nothing short of full evidence of satisfactory testing will be acceptable on any significant building under the new regime"

To evidence that a design is compliant, designers will need to set out the standards that apply to the products and systems in their design, and the performance levels to be achieved. To show that a building is compliant, the contractor will need to demonstrate, with hard evidence, that the products used achieve the performance required by the design. If, for example, a fan should meet certain noise requirements, the contractor will need evidence that the fans installed meet that requirement.

How will they do that? One option might be to tell the building control professional (who will be on a statutory register, working to a national standard) that the manufacturer's literature says the product complies. I suspect they will want to see hard evidence that the product has been tested against the appropriate standard. That will mean verifiable test reports – in many cases from a third-party testing body – detailing what test was undertaken and on what product, and what the results were. These are all set out clearly in any formal product-testing standard. To claim that a product complies with a standard will require evidence that it has passed all the relevant tests.

Some manufacturers are said to be unhappy about disclosing test results, which they consider to be their intellectual property (IP). Given the revelations about some manufacturers' behaviour at the Grenfell Tower Inquiry, nothing short of full evidence of satisfactory testing will be acceptable on any significant building under the new regime. Those who wish to protect their IP may do so, but may find themselves short of orders. Those who can evidence satisfactory testing will be at a clear advantage.

And it's not just the regulator who will be interested. I know an insurance underwriter who carries a copy of the Morrell Day report into product testing and certification, and asks potential customers what their business knows about the report, and what it is doing in response to its findings. He sees the importance of knowing what is going into the risk he is being asked to insure, and is not going to be fobbed off by spurious appeals to IP protection when being asked to insure an expensive physical asset.

DR HYWEL DAVIES
is chief technical officer at CIBSE
www.cibse.org

CIBSE ANZ on the front foot

CIBSE Australia and New Zealand region is developing a course for new engineers to drive up building services knowledge

Australia is known to be very good at two things right now: cricket and operational building performance ratings. While the Baggy Greens are the reigning World Test Champions and current holders of the Ashes, the Nabers rating scheme is held up as an exemplar for measuring real-time building performance.

CIBSE Australia and New Zealand regional chair Phil Senn is proud of the initiative, but says the lack of federal support for decarbonisation until recently has meant there has been 'a lost decade of climate action' in Australia.

While CIBSE engineers were advising clients not to use gas, there was a lack of mandatory targets driving the transition to net zero, he adds. Despite this, there are many exemplar buildings in the region, including Murdoch University's stunning all-electric Boola Katitjin building, which we feature on page 20.

One of the challenges in the region is attracting young engineers into the industry, partly because there is no formal building services tertiary education. 'Most people stumble into building services through having done mechanical or electrical courses,' says Senn.

To help those new to the industry, the ANZ Region has developed a comprehensive training course for engineers. 'It's a project that's been under way for some time in terms of development and the first modules are now being delivered in a number of states' he says.

Having the team from CIBSE headquarters visit Australia was a 'real shot in the arm' and enabled Senn to cement relationships with the CIBSE Board. He's looking forward to meeting the President's challenge of creating 10 STEM Ambassadors in the region.

The ANZ chapters run monthly technical seminars for Members. Currently, the big topics are electrification, embodied carbon and climate resilience – not surprising as the region faces up to more floods, droughts, wildfires and typhoons brought on by climate change.

The region works closely with the Green Building Council of Australia (GBCA), and CIBSE Guidance – such as the TM65 ANZ addendum – features in GBCA guides.

CIBSE ANZ has more than 20 women volunteering in its chapter and YEN committees across the region. To mark International Women in Engineering Day on 23 June, six women have highlighted the roles they play as engineers. At **bit.ly/CJINWED23**, they share their working days, their aspirations, and what they enjoy about their work as engineers. **#INWED23**

This month's *Journal* has a special focus on the ANZ region and, on page 61, features a Q&A with ANZ Engineer of the Year Alex Shan. Australian Arup engineer Jake Cherniayeff also discusses museum fire suppression on page 49.

Clearing the smoke

A British Standard for smoke control projects aims to eliminate confusion about the way smoke control systems are installed and maintained. SCA member **Allan Meek** explains

Over the past few years, there have been several, reasonably high-profile examples of failures of smoke control systems in occupied buildings. In addition, details published in the Cross Safety Report suggest that 60-80% of buildings have failed cause and effect testing. These failures have been attributed to flaws, such as vents opening in the wrong direction, design-critical vents not opening at all, or systems not 'locking out', allowing the operation of vent doors beyond the fire floor.

Many of these issues can be put down to unfamiliarity on the part of specifiers and the authority having jurisdiction, who may not deal with complex smoke control systems on a regular basis and, consequently, have no system in place to monitor effective implementation. The prevalence of fire-engineered solutions being employed instead of Approved Document B-compliant provision exacerbates the issue, as there is no handbook to refer to for a definitive answer.

There is, however, a relatively simple way to avoid common problems and guarantee a positive outcome – by managing design, installation, commissioning and maintenance in a systematic way, as detailed in *BS 7346-8:2013 Components for smoke control systems*. This standard provides a routemap for successful delivery of a smoke control solution, from design through to handover and maintenance, and can be applied to all system types. It covers: identifying system requirements; planning and design; installation; commissioning and verification of correct operation; and maintenance and servicing.

The code defines key processes to be managed and identifies roles and responsibilities for these, with clear guidance on performance requirements and the documentation to be provided. Evidence of compliance is required throughout the lifetime of a project and there are useful templates for areas such as handover and performance testing. Employing this standard at the outset of projects would eliminate a high number of the faults that we have seen recently.

The standard highlights certification and verification by authorised bodies, and provided the platform for the Smoke Control Association (SCA) to introduce its IFC SDI 19 third-party certification scheme, to which SCA members must sign up. This means every SCA member installing smoke control systems is suitably skilled and experienced in fire-strategy verification, system design, installation, and commissioning, with highly trained staff that adhere to best practice.

ALLAN MEEK is a director of Group SCS, a member of the SCA
www.smokecontrol.org.uk

LEADING THE LINE

To ensure engineers can meet net zero challenges while adhering to the building safety regime, CIBSE President **Adrian Catchpole** FCIBSE is launching bold initiatives to increase competency, tackle poor procurement and attract talent to the industry. **Alex Smith** reports

Catchpole stands outside the entrance to the Cobbold Stand at Ipswich Town FC

In his CIBSE Presidential Address, *Taking a lead*, Adrian Catchpole FCIBSE called on building services engineers to step out of their comfort zone to guide and inspire others to cut carbon emissions in the built environment.

Speaking to a packed room at The Royal Society in London, CIBSE's incoming President said it wasn't just organisations that needed to meet the challenges of cutting carbon.

'As engineers, we must help move the built environment from being a significant contributor to global emissions to being an exemplar of how to reduce them,' said Catchpole. 'Each one of us needs to step forward with solutions and commit to taking a lead.'

To decarbonise building stock and respond to the requirement of the Building Safety Act, there needs to be increased competencies, innovation and collaboration, said Catchpole.

During his address, he announced CIBSE initiatives aimed at attracting talent, upskilling engineers and increasing dialogue across industry. They are: a STEM Ambassador Scheme, designed to attract more young people into the industry by matching engineers with secondary schools; CIBSE's new Chartered Organisation Programme, which will enable organisations to demonstrate competence; and a cross-industry collaboration on improving procurement procedures to ensure that net zero carbon buildings meet their design intent.

Catchpole says he is delighted by the response to his address: 'People called it challenging, inspirational and presidential. It's been overwhelming and LinkedIn messages haven't stopped.'

Like many building services engineers, Catchpole's route into the industry wasn't by design. He wanted to be an architect and, at 16, applied for a job as an architectural technician at Ipswich multidisciplinary consultant Johns Slater and Haward (JSH). He didn't get the job, but impressed the company enough to be offered an opportunity in M&E engineering.

'It's the best thing that could have happened to me,' says Catchpole. From there, he went to work at Ipswich Borough Council and it sponsored him through his degree at the University of Hertfordshire, which involved a five-hour return trip to Hatfield.

'East Anglia is still one of only three regions in the UK without a CIBSE-accredited degree course in building services,' laments Catchpole, who returned to JSH in 2001 and is currently a director at the firm.

While he has spent his career in Ipswich, it has not limited his opportunities. 'Building services engineering is so wide-ranging,' Catchpole says. 'I've done everything, from a one-off domestic heating installation that changes the life of a disabled person, to overseeing dock developments in Liberia.'

One of his most important career moves was 30 years ago, when he decided to volunteer for CIBSE. 'I wanted to give something back,' says Catchpole, who started as education secretary at the CIBSE East Anglia Region and, more recently, was CIBSE treasurer for four years.

The value of collaboration

Working across CIBSE taught him the value of collaborating with others to spread knowledge and new approaches. 'We don't do it enough,' says Catchpole. 'You achieve so much more when you collaborate, whether it's in your own offices, with colleagues, or with wider industry partners. Engineers tend to sit in silos and do their own thing.'

In his presidential address, Catchpole highlighted the cross-industry coalition behind the development of the Net Zero Carbon Buildings Standard (NZCBS) as a prime example of successful collaboration.

For UK buildings to stand a chance of meeting the new NZCBS, which is expected by the end of the year, there will need to be a change in industry procurement practice, he says. Encouragingly, RICS, iStructE and RIBA have agreed to discuss how industry could collaborate more effectively.

Catchpole wants to see performance metrics incorporated into procurement

processes, and more emphasis on testing and commissioning and post-contract evaluations. He wants a fundamental review of how value engineering is assessed, so it is not just focused on short-term capital gain, and wants to see its impact on building performance, whole-life operating costs, maintenance and safety.

'Collaboration makes us so much more successful, individually and with our wider industry partners,' Catchpole said in his address. 'As engineers, we have great skills to break things down, analyse the individual parts and make improvements. Each one of us needs to be prepared to do this more often, so that the full benefit of knowledge and process sharing can be realised.'

Demonstrating competency

The competency of engineers was a key theme of Catchpole's address, particularly in the context of the Building Safety Act, under which new duties will increase the accountability, transparency and oversight of all industry participants.

CIBSE is developing a new Chartered Organisation Programme, which will help building services firms demonstrate their competency. It will allow organisations to work towards a set of predetermined criteria, to show that they are competent and professional, operate to high business and ethical standards, and are committed to developing and maintaining qualified staff.

Proposals for a competency framework are currently being peer-reviewed, Catchpole says, and could lead to the inclusion of carbon-reduction plans, enhanced levels of continuing professional development for individuals, and personal development plans.

'This will be a badge that will make it easier for businesses to demonstrate their competencies,' he adds. 'The idea is that those employing consultants will insist on an M&E company that is a CIBSE Chartered Organisation. As a mark of quality, it will allow organisations to differentiate themselves.'

Call for STEM ambassadors

A key focus of Catchpole's presidency will be initiatives to attract more young people into building services. He wants to inspire secondary school children to become engineers and believes the industry's combination of technology and sustainability is very attractive to 16 to 18-year-olds.

'We have computers, building simulation, 3D modelling and data exchange. If you roll all of that into the role we play in saving the planet, surely we can attract more people to join us,' he says.

The STEM Ambassador Scheme announced by Catchpole aims to match engineers' skills with schools, and he is challenging CIBSE's 17 regions to each recruit 10 STEM Ambassadors over the next 12 months. He was inspired to create the scheme because he found it so difficult to get into schools when he was the region's education officer.

'Basically, we were cold calling, and if we did find the right person to speak to, there was a chance they had left by the next term,' he says. 'Whereas if they are logged into the portal and asking for someone with building services skills, they can easily find us.'

Catchpole wants employers to show leadership by supporting this scheme and encouraging their staff to participate. 'It's only by working together that we will really make a difference,' he says, adding that all engineers should take the opportunity to lead by example.

For his part, Catchpole has been on his own carbon neutral journey, by offsetting 200% of the remaining carbon for himself and his family that cannot be further reduced through practical and pragmatic home improvements or lifestyle changes.

His presidential address ended on the theme of individual responsibility, with a plea to his fellow engineers: 'Each one of us needs to step forward with solutions and commit to "taking a lead".' CJ

> "We must help move the built environment to being an exemplar of how to reduce global emissions. Each one of us needs to commit to taking a lead"

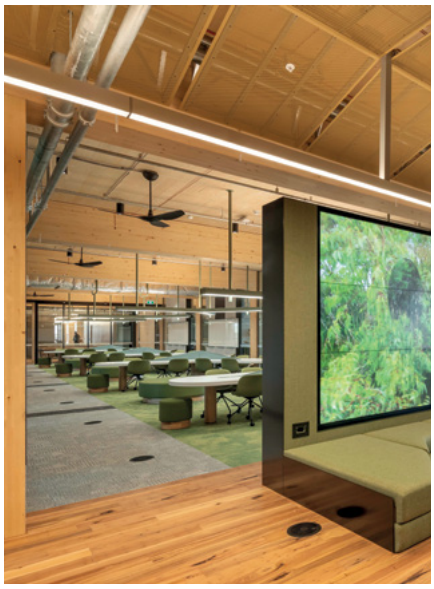
Past president Kevin Mitchell passes the Presidential Medal to Catchpole

THE 15-MINUTE TOWN

Catchpole is grateful that many of JSH's M&E projects are only a 15-minute walk from his office overlooking the yachts of Neptune Marina in central Ipswich. He presided over an innovative conservation heating retrofit at the nearby Grade-I listed Christchurch Mansion, for instance, and his practice, Johns Slater and Haward, is currently working on a number of projects at nearby Ipswich Town Football Club.

Catchpole is an avid fan of the 'Tractor Boys', who have just been promoted to the Championship. Investment by the club's ambitious American owner has given it a financial lift, and his colleagues are helping deliver major improvements to the club's Portman Road ground. These include a new TV studio and a state-of-the-art hybrid pitch of natural and artificial grass, served by a new sprinkler system and undersoil heating. 'The club's success is a real boost for the town,' says Catchpole.

Catchpole grew up with the successful Ipswich Town sides of the 1970s and '80s



NDY did extensive energy modelling with the architect and façade engineer to ensure the optimum façade solution

CONNECTING TO COUNTRY

The Boola Katitjin building breaks boundaries with its radical timber design and innovative engineering. **Andy Pearson** finds out how the project team achieved a 6-Star Green Star rating by working with the bush environment

"Every non-standard fire projection detail had to be tested specific to the species of timber, because they all behave differently in a fire" - Alex Rodger

Murdoch University, in Perth, Australia, wanted its spectacular new teaching and learning building B360 – known as Boola Katitjin – to be, among other things, an exemplar of sustainability. Lyons Architects' response was to minimise its use of concrete by designing the largest mass timber building in Western Australia and the largest educational building built from engineered timber in the Southern Hemisphere.

At 184m long and 30m wide, the four-storey building is supported on a glue laminated (glulam) timber frame, incorporating beams with spans of up to 18m, which, in turn, support cross-laminated timber (CLT) floor slabs and secondary beams. The building's radical design is pushing the boundaries of what is possible in timber and façade engineering.

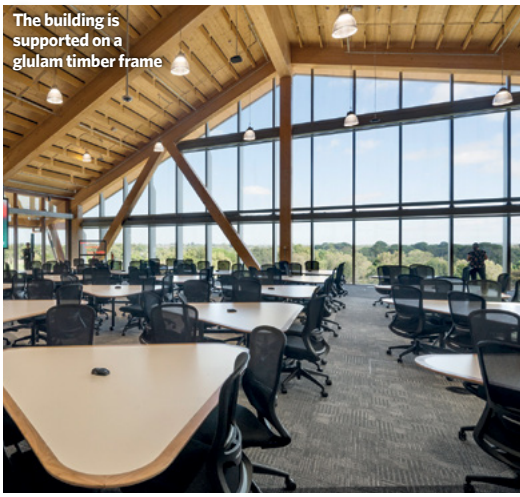
Norman Disney & Young (NDY) was engaged by Lyons to advance what is possible in terms of sustainable building services engineering. NDY targeted the Green Building Council of Australia's 6-Star Green Star certification for the learning centre, the highest standard under the rating system.

'The university wanted an exemplar sustainable building and Lyons was key in helping achieve that objective,' says Renee Fourie, a director at NDY.

Fundamental to Lyons' architectural concept was to expose the building's timber structure, outside and in. 'Exposed timber meant we could not have ceilings within the building, so we had to put our heads together to come up with a means of servicing the building while keeping the CLT soffits free of building services clutter,' Fourie says.

The expansive timber building is orientated along a north-south access, as part of Lyons Architects' masterplan for a new gateway to the campus. One of the most striking elements of the design is the huge column-free rear entrance and gathering space, which is outside the building, but sheltered beneath its asymmetrical pitched roof at the northern end of the building.

Inside, more than 16,000m² of enclosed


The building is supported on a glulam timber frame

formal teaching space is split between a variety of different-sized rooms, designed to accommodate 30, 60, 90 or 120 students. These rooms are positioned along both sides of the 6m-wide central corridor that bisects each of the four timber floor plates. In addition to providing circulation space, the corridors are designed to double as informal gathering, study and peer-learning areas. The corridors and informal meeting spaces operate under a mixed-mode ventilation strategy with relaxed environmental conditions, while the enclosed, formal teaching spaces are air conditioned.

To ensure the timber soffits remain free from ductwork and other engineering clutter, conditioned air is supplied to the formal teaching spaces through a raised floor void. This has the added benefit of making it easier to adapt the layout to accommodate future learning and teaching needs.


The PV array is currently predicted to generate up to 450kWp of electrical energy

'The client and architect really wanted the timber to be on display, so the need for an 800mm sub-floor space to accommodate the mechanical ventilation and cable trays was an easy sell,' Fourie says.

To keep ventilation ductwork to a manageable size, NDY divided the building into three service zones, or 'pods', along its length. Each pod is serviced, top-down and bottom-up, by air handling units (AHUs) concealed in attic plant areas at high level and in ground-floor plantrooms.

Air distribution risers are generally located against room partition walls and are made from lightweight material, unlike the building's concrete stair cores and ground-floor slab, which are the main elements of the superstructure and the only areas not to have been constructed from timber. To help rationalise the conditioned supply air temperature and maintain tight temperature controls, each pod is further subdivided into perimeter and internal thermal zones.

AHUs incorporate heating and cooling coils. Peak external design temperature is 38°C, with the AHUs sized to maintain a temperature of 22-24°C in formal teaching spaces. Air supply rates are demand-led, based on thermal demand or CO_2 levels.

Chilled water is supplied to the building from a centralised campus-wide chilled water distribution system. Hot water is provided from a separate air source heat pump, making the building fossil-fuel free.

'We were very fortunate in that segregation into service pods and the use of the sub-floor services space were agreed within the first month of design. However, the scale of the building and location meant a lot of subsequent work went into preforming services penetrations in the timber structure and energy modelling to optimise the »

Corridors double as informal teaching and gathering spaces

» façade and natural ventilation pathways in order to minimise cooling energy demands,' says Fourie.

'We carried out extensive energy modelling with the architect and façade engineer [Inhabit] from very early in design development, which continued throughout the design process to ensure the optimum façade solution.'

Alex Rodger, chief engineer and project director at NDY, explains: 'Our approach was to work with Lyons to enable the building to take advantage of the climate, where this was beneficial, while protecting the building against the extremes of summer heat to produce the best possible sustainable outcomes for the building.'

As a result, the design has been developed to take advantage of the 'Fremantle Doctor', Western Australian vernacular for the cooling afternoon sea breeze that blows in from the west during the summer months.

'It gives respite from the summer heat, so we've designed the building to have automatic openable walls and louvres to take advantage of that; we were not looking to create a triple-glazed, sealed box, and the concept from inception was to create a permeable building,' Rodger says.

The motorised louvres open up to allow outside air to enter what Rodger calls 'breezeways'. These are formed by the circulation corridors and informal meeting areas, which operate as elevated temperature-controlled spaces. When conditions allow, they can be naturally ventilated for up to 40% of the year. To inform the façade and natural ventilation design, NDY undertook detailed wind microclimate and thermal comfort studies.

A rooftop weather station provides information to determine when and how the natural ventilation mode will operate by controlling which façade louvres open and close, and by how much.

'We look at wind speeds and direction, air temperatures, and periods of time for when temperatures are within the natural ventilation band or the wind speeds are below – or above – a certain criteria. Then the actuators on the façade or the auto-doors will operate,' Fourie explains. 'Over time, if the users determine that these bands are too tight or not tight enough, that can be easily adjusted'.

When the temperatures are detected outside of the design parameters (currently between 19°C and 26°C), or if the wind speed or rain increases to uncomfortable levels, the ventilation louvres will close and the traditional air conditioning systems will operate. The system then checks periodically to determine whether the outside air conditions have returned to that which are favourable for natural ventilation.

Digital modelling was also used to develop the form of the building's asymmetric roof. This is designed to provide shading to the east and west façades in response to the sun's path. In addition, the roof is used to house a substantial PV array. This is currently predicted to generate up to 450kWp of electrical energy, which will offset up to 60% of the building's total annual electrical demand. The roof has the space to add another 100kW of PV in the future.

Unusually, the building, which is built into

COLOUR MAPPING DRAWINGS

NDY has produced a colour-mapping process linking spreadsheet data to Revit models so it can start developing the design while the architect is still creating layouts and moving rooms around. It uses colour mapping on the drawings to graphically depict various building services design solutions and parameters during the early design phases.

NDY assigns parameters in a spreadsheet format, which it connects to the digital model of the building to convey to the architect how it is planning to service the building from each specific discipline's perspective. Specific parameters are assigned to a room – for example, lux levels, mechanical temperature bands, or a servicing philosophy – so that, if the room is moved in the Revit model, the parameters move with it. 'It enables us to very quickly adapt to architectural changes early in the design development,' says Fourie.

The colour-mapping system also makes it easier for non-technical clients and user groups to sign off a scheme. Instead of having to sign off a lighting layout, they can sign off a colour-mapped space that might have, say, yellow areas showing office-type fittings delivering 300lux and blue areas where the lighting is designed to deliver 150lux.

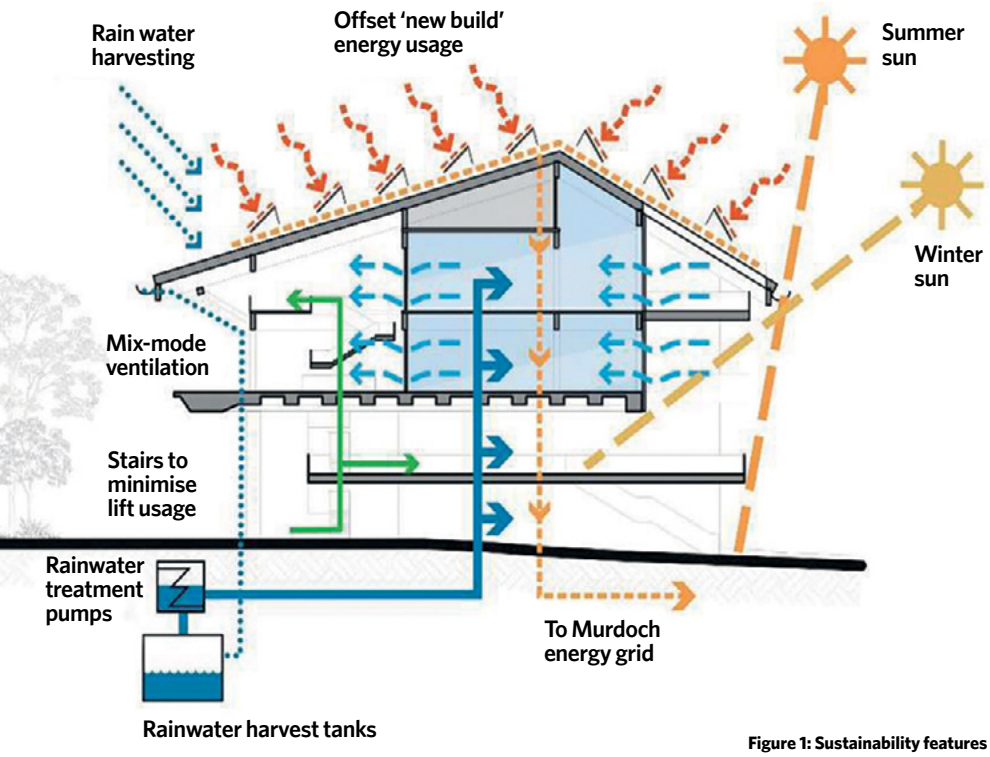


Figure 1: Sustainability features

the sloping site, includes a series of escalators to encourage students to walk through it to access the remainder of the campus.

In addition to providing vertical transportation, building services, sustainability and electrical design services, NDY was responsible for the building's fire engineering and acoustics. This included doing a bushfire assessment, because the campus is located next to a bushfire zone.

'We had to undertake the assessment early on in the design, because it informed some of the architectural design, which had to deal with elements such as the potential of glowing embers being blown through the air and onto the building,' Fourie explains.

Because it is constructed primarily from timber and is located on the edge of a bushfire zone, there are sprinklers throughout. The fire engineering report ran to 1,000 pages, Fourie says, and included information on predicted charring rates for the three timber species used to construct different elements of the building, as well as project-specific fire testing of services penetration detailing and selected products.

Rodger continues: 'The sourcing and early procurement of the timber supplier was key to the project's success, as every non-standard fire projection detail had to be tested specific to the species of timber, because they all behave differently in the event of a fire'.

> "A lot of subsequent work went into energy modelling to optimise the façade to minimise cooling energy demands" – Renee Fourie

The building opened in February, the start of the academic term in Australia. After a year in operation, NDY is planning to compare its energy usage over that time with its energy modelling predictions, to see what can be learned from the building.

The initiative is wholly appropriate, because the building's name – Boola Katitjin – translates from the local Wadjuk Noongar language as 'lots of learning'. It acknowledges the significance of the land on which it stands, which has been a place of Aboriginal learning for thousands of years. CJ

BIODIVERSITY: ENGINEERING NATURE'S BLUEPRINT

With developments soon having to create a 10% biodiversity net gain, **Ashley Bateson**, **Chin Chen** and **Robert Winch** discuss why nature-based solutions are vital in reducing climate risk

We are in a climate and biodiversity emergency, two interlinked crises with local and global impacts being felt today. Increasingly, reducing dependence on fossil fuels has become a key priority for businesses, governments and people across the world. A catalyst for this was the 2015 Paris Agreement, adopted by more than 90 countries, which set a clear and shared goal of pursuing efforts to limit global warming to 1.5K.

Many consultants in the built environment – including engineers, architects, project managers and landscape architects – have signed up to the international declaration of the climate and biodiversity emergency.[1] In the UK alone, more than 120 companies have joined the Building Services Engineers Climate and Biodiversity Emergency Declaration.[2] This is a commitment to collaborate, share knowledge and advocate increased resource efficiency on projects and more regenerative design principles.

The importance of biodiversity has not come under the same spotlight as decarbonisation, but we are on the cusp of change. At the World Economic Forum in 2020, a new global ambition was born: 'nature positive by 2030'. This is viewed as the biodiversity equivalent of the Paris Climate agreement. A driving force behind this shift in focus is nature's unprecedented freefall; since 1970, the relative abundance of monitored wildlife populations has declined by 69%. This figure was 60% five years ago.[3]

The need for designers to be more aware of the role of protecting and incorporating nature in building development was also recognised at a recent annual conference of the UK Building Services Engineers Climate and Biodiversity Emergency .[4]

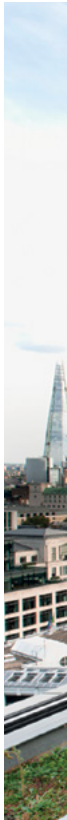
The need to protect and restore biodiversity

At the most basic level of reasoning, nature must be protected and restored because it is fundamental to our survival. Our natural world provides the clean air, food and water we need to thrive; it enhances our wellbeing and reduces threats of zoonotic diseases.

Nature's services to us – otherwise known as ecosystem services – are near infinite, and include everything from climate regulation, pollution reduction, medicinal plants, construction materials, and eco-tourism.

In the UK built environment, a radical transformation is under way to revalue nature. This is, in part, spurred by national regulations that, from November 2023, will require all developments under the Town and Country Planning Act to create a 10% biodiversity net gain – something that many local authorities already require to be exceeded. (Small sites will have to meet the target in April 2024).

This legal mandate is encouraging developers and asset owners to seek out the multifunctional benefits associated with nature. Beyond planning requirements, organisations have, since May 2023, been able to set science-based targets for nature, similar to their carbon equivalent (see panel, 'Science-based targets for nature'). This approach gives companies a clear structure to protect and restore nature in line with science.



Green landscaping supports the delivery of climate-resilient development by providing climate mitigation and adaptation benefits. The new headquarters for CABI, in Wallingford, incorporates nature into the building design to align with the CABI's mission to use bioscience to solve global environmental challenges

Green infrastructure

Nature-based solutions provide green infrastructure such as green walls, biodiverse roofs, gardens, parks, and sustainable urban drainage systems, which have social, economic and environmental benefits. To date, engineers haven't fully incorporated these solutions in their toolboxes, but – if used at scale – they offer a means of reducing the risks of the climate and biodiversity emergencies.

As building solutions, they not only have a low – or, in some cases, negative – embodied carbon impact, but over their lifetime actively pull carbon out of the atmosphere. Furthermore, focusing on nature-based solutions results in an uplift to site biodiversity.

The biodiverse roof terrace at 1 New Street Square, in the city of London, provides microclimate and biophilic benefits for the occupants of this office building for Deloitte

Modern developments typically target a wide spectrum of outcomes to ensure they deliver against various stakeholder expectations. Because of their diverse range of benefits, nature-based solutions are becoming an increasingly more cost-effective way to deliver on these priorities.

Green roofs are an increasingly common nature-based solution, particularly in urban areas with scarce space. 1 New Street Square, London, the Centre for Agriculture and Bioscience International (CABI) HQ in Wallingford, Oxfordshire, and the University of Greenwich Library are examples of developments that have embraced green roofs as part of their design. In addition to their basic function of providing shelter, these roofs are outcompeting their traditional alternatives by improving building performance and occupant experience.

One significant benefit of a green roof is its ability to alleviate some of the urban heat island affect by shading heat-storing hard surfaces and absorbing solar radiation through evaporation and evapotranspiration. This reduces internal and external air temperature by, on average, 4K and 1K respectively. Green roofs can also, on average, reduce noise by 11dB, increase property value by 6.9% and store 73% of rainwater runoff.

Quantifying nature's value

Nature's economic, environmental and social value has historically been hard to quantify. For this reason, nature has struggled to be fully used in building design. An ambitious masterplan in west London is being used as a test bed for creating an approach to help quantify the value of a landscape-led development.

For this, a Defra Natural Capital Tool has been produced, using data from a meta-study of scientific papers to build a value profile for each nature-based »

solution type. These profiles enable landscape strategies to be appraised on how they contribute to the attainment of the development's sustainability targets, business priorities and wider value creation. The aim is to influence and support decisions around landscaping design based on the desired attributes being sought.

Take a typical masterplan containing a busy high street with lots of pedestrians and road noise, for example. Priorities might include reducing the risk of pedestrians overheating in summer, decreasing noise pollution for building occupants, and avoiding flood risk. The tool could be used to identify the mix of nature-based solutions to optimise delivery against these priorities. For instance, it would identify that trees, on average, reduce air temperature by 3K, can absorb 4dB of sound, and reduce rainwater runoff by 43%. Trees also contribute to net zero targets by sequestering carbon, and help attract retail tenants by increasing people's willingness to spend in local businesses by 30%.

Nature-based solutions can also return financial value. Last year, the UK Green Building Council (UKGBC) released a report that outlines how nature-based solutions can be the basis for financial benefits and new revenue streams.[5]

Takeaway

Nature-based solutions can be viewed by engineers as an extension to their toolbox of approaches. In practice, they will probably require new cross-discipline working partnerships, to tap into the expertise of landscape architects, ecologists and sustainability consultants to apply solutions to real-world projects. **CJ**

ROBERT WINCH is a senior consultant and **ASHLEY BATESON** a director, both at Hoare Lea, and **CHIN CHEN** is a senior associate at Grant Associates.

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Over their lifetime, nature-based solutions actively pull carbon out of the atmosphere

SCIENCE-BASED TARGETS FOR NATURE

Science-based targets for nature (SBTN) – developed by the Science Based Targets Network, a collaboration of global non-profits and other organisations – are designed to help organisations measure and address environmental impacts across the supply chain, using the best possible science available.

The targets focus on impacts on the environment that organisations should avoid and reduce – such as deforestation and pollution – as well as positive impacts, including watershed restoration and the rehabilitation of degraded land.

Land and freshwater targets that support biodiversity are the first action areas that SBTN are making available for companies to set targets against, to reduce their negative impacts and increase positive outcomes for nature and people. The first methods help firms address their impacts across their direct operations and upstream supply chains.

This includes technical guidance for organisations to assess and prioritise their impacts on freshwater quality (specific to nitrogen and phosphorus) and freshwater quantity. The guidance for land targets are designed to protect and restore ecosystems.

SBTN are similar to the Science Based Targets initiative (SBTi), launched in 2015 as a collaboration between a partnership between CDP, the United Nations Global Compact, World Resources Institute and the World Wide Fund for Nature (WWF), which helps companies reduce their emissions in line with climate science. SBTi provides the framework and tools for companies to set science-based net zero targets and limit global temperature rise above pre-industrial levels to 1.5K.

Sector-specific targets have been developed for a number of industries, including power, cement, and financial institutions. In May, draft guidance was published for the building sector: see bit.ly/CJJul23SBT.

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PIPE DREAM OR REALITY: TRUE VALUE ENGINEERING

Value engineering at an early stage will ensure the focus is not just on costs, but also on a better design outcome. This was the conclusion of an expert panel discussion sponsored by Geberit. **Amanda Birch** reports

In a break from *CIBSE Journal*'s roundtable format, Geberit sponsored an innovation evening with key industry panellists and a live audience at the Building Centre, London.

Martin Murray, national specification sales manager of piping at Geberit, kicked off the May event by introducing the topic: value engineering versus engineering value. This subject generated an interesting debate, with the discussion raising other issues, including: the implications of the new competency regulations under the Building Safety Act 2022; the importance of early value engineering workshops at the pre-planning stage; and the benefits of collaboration between the design and construction teams.

Malcolm Atherton, director, and design engineer at Water Consultants, began by considering whether value engineering on a project goes beyond the cost of the materials and construction methods? 'Every single project that I'm involved with [dealing with above-ground drainage and domestic water services] is about cost. It's never about a suitable alternative,' said Atherton. 'Quite often, the contractor will ask can we change it to a cheaper material, or how can we change things to make the cost come down? That's their perception of value engineering.'

Minesh Varia, project director at Hoare Lea, agreed, but added that he has seen a shift in the way clients are expecting a more sustainable approach in projects. Post-Grenfell, he has also seen a heightened sense of scrutiny with projects and greater engagement between fire engineers and building control officers.

'There is proper value engineering, rather than cost cutting, and the larger, mature clients are wanting a higher standard of product,' he said.

Ana Santos, principal public health engineer at Aecom, said her experience is similar, and that her involvement with a range of projects – including offices, high-end residential and fit-outs – has given her a different perspective on value engineering.

'It depends a lot on the scale of the project,' she said. 'The big-scale projects are normally focused on providing their client with a good sustainable product, while the fit-outs must often be done quickly and cheaply. I think there will be a shift, especially with the Building Safety Act and other changes that will force the way we see value engineering.'

James Warne, director of Inhabit, is a design engineer leading MEP, civil structures, façade design, and sustainability. He said value engineering comes in different forms and stages of a project, and argued that it is successful when the team focuses on operational outcomes and uses soft landings, which aims to bridge the gap between design and operation by encouraging

THE PANEL

Chair: Alex Smith, editor, *CIBSE Journal*
Malcolm Atherton, director, and design engineer at Water Consultants
Antony Corbett, product applications engineer at Geberit
Hywel Davies, chief technical officer at CIBSE
Ana Santos, principal public health engineer at Aecom
Minesh Varia, project director at Hoare Lea
James Warne, director of Inhabit

ongoing collaboration. But, he added, it can be a challenge to get everyone to attend a value engineering workshop to see what the operational outcomes are.

'If value engineering is left to the last moment – for example, when the contract is about to be signed – and you're trying to bring it under budget because it's over budget, this is cost cutting and leaves things open for contractors,' said Warne. 'I'm not suggesting the contractors are doing anything inappropriate, but they are being asked to reduce their costs and they are allowed to do it by any means necessary within the contract.'

He said this happened on a school project on which he worked. A significant amount of money had to be cut from the budget and, as the contractor was given free rein, the design suffered as a result.

'The earlier we have those value engineering workshops the better, and it's about engaging with the right people,' added Warne.

Antony Corbett, product applications engineer at Geberit, echoed the panellists' views. When Geberit products are specified, he hopes to see them go through to build stage and be used on a project. Instead, what often happens, he said, is that a particular product gets specified and, at the procurement stage, an M&E contractor decides to value engineer. The contractor then selects a product that they deem is an equivalent, but that might not fit the original specification correctly.

'If our product gets downgraded at a later stage, it's usually down to cost,' said Corbett. 'We're asked whether we can match a price that comes with a product and, very often, we can't, because it's a completely different product and doesn't fit the original specification.'

Hywel Davies, chief technical officer at CIBSE, cut through the discussion by highlighting the new competency regulations of the Building Safety Act that is coming into force. These will present some serious challenges and implications for anyone wanting to value engineer a project.

If a change is made – whether it be a product substitution or a design alteration – the person making it will need to demonstrate that any alternative is fully compliant and has the same performance as the original. Also, if a design is modified, they will need to prove that they are a competent designer. If they meet these criteria, they need to sign off the modified design and demonstrate that they have professional indemnity insurance.

Davies warned that enforcement action is now being taken very seriously, particularly on high-risk buildings such as hospitals, care homes, residential, and buildings more than 18m tall. It will be against the law to start building works before a regulator has signed off the design, and the penalties are severe.

'The new competency regulations in the Building Safety Act change many of the building control processes and apply to all regulated building work,' said Davies.

'The latest figures from the planning gateway one suggests that as many as 50% of projects are being knocked back by the regulator because the fire strategy is inadequate. I find this staggering, given that it's been nearly six years since Grenfell.'

However, Varia put a positive spin on the value engineering process. He agreed that it should happen early, at the pre-planning stage, and said that it works well when the client is fully engaged in the process and understands the risks.

»

"New competency regulations will present some serious challenges and implications for anyone wanting to value engineer a project" – Hywel Davies, CIBSE

» 'I sometimes feel we [architect, structural engineer and MEP] work in silos when we go through the value engineering process,' said Varia. 'But when we have a collaborative approach, that's when we get the most significant value engineering opportunities.

'We're having more grown-up conversations with contractors, as they have a lot of knowledge on products, buildability and prefabrication. Given that we're getting tender returns at 20% higher than the cost plan because of inflationary pressures, projects will stop unless we find a suitable compromise with contractors on the budget.'

Santos enthusiastically agreed. 'As designers, we need to understand that the contractor's role is difficult and they work to very tight programmes,' she said. 'They also work with designs that are not good, and sometimes they need to make changes, which are not always bad. Legislation requires us to build bridges across the different disciplines and we are changing, as designers, in the way we look at this communication.'

Given that sustainability, energy savings, embodied carbon and operational carbon are all in the spotlight, said Santos, these aspects remind engineers that they must design differently. Clients are aware of this, and contractors are being forced to see this, to ensure the project meets the client's expectations.

Santos recently completed a refurbishment project that, she said, was very successful mainly because everyone's different points of view were respected. There was a desire to do better, and good communication between the multidisciplinary teams was key to its success.

Warne is very supportive of this approach. 'Without doubt, good results come from collaborative teamwork,' he said. 'We need to stop building boundaries and say that we're all part of one team. We must value engineer, not cost cut, and value engineer at an early stage. Well-informed clients make this process easier, but competent designers should take the lead.'

Warne, however, argued that we face a significant challenge to comply with the Building Safety Act, which requires competent people. Because of the massive skills gap across every stage of the construction industry, he said, there aren't enough skilled people to do the construction work over the next 30 years. He suggested that modern methods of construction and innovation could be employed to look at how to de-skill processes.

"Every single project that I'm involved with is about cost. It's never about a suitable alternative" – Malcolm Atherton, Water Consultants

But Atherton is concerned: 'The real danger is that, if you go too far de-skilling something, the person physically doing the process won't fully understand what it is they are doing and the importance of what they are doing.'

Warne agreed about the risk, but argued that the industry needs to find the answer, given the shortage of

"As a conglomerate of manufacturers, we're having conversations about making sure our products meet standards and that, when any of the products are specified, they meet the building requirements" – Antony Corbett, Geberit

competent, skilled people in construction. 'The only way forward is to find a way of constructing a building that's on time, within budget and requires a de-skilled labour force,' he said.

'I've got some good news for James [Warne],' added Davies. 'One of the other duties we expect to be in there [the Building Safety Act regulations] is a duty to cooperate between all members of the design team and construction team.'

Corbett agreed that conversations with architects, specifiers, consultants, contractors and installers are crucial, helping them to understand the different perspectives and requirements of products. 'I sit on a couple of technical committees for the British Metal Tubes and Fittings Association and the British Plastics Federation,' said Corbett. 'As a conglomerate of manufacturers, we're having conversations about making sure our products meet standards and that when any of the products are specified, they meet the building requirements.

'We're making sure that our products are fully compliant and that they will do what they must do for the lifespan that the client of that building requires.' Davies was then asked how the industry gets the message across about important regulation updates to smaller building firms, which often don't have the time to keep abreast of the latest information.

'With great difficulty,' said Davies. 'Many smaller contractors probably don't know about the Building Safety Act and won't make the connection between what happened at Grenfell and the work they do. Responsible manufacturers have got both a role and an opportunity here by providing basic information about the act and the expectations.

'Manufacturers will need to be careful, though, that their technical literature isn't seen as design information, because – if something goes wrong – they don't want to be seen as responsible.'

Corbett added: 'There will be greater onus on manufacturers to provide precise detail on what their products can do and what they're manufactured from.

'Any technical details that are publicly available will be required by the Building Regulations and construction product regulations, and for that information to be correct.'

"We're having more grown-up conversations with contractors, as they have a lot of knowledge on products, buildability, and prefabrication" – Minesh Varia, Hoare Lea

The new building safety regime and focus on net carbon zero buildings means procurement processes must ensure real value engineering.

Without early engagement, collaboration, and a focus on operational outcomes buildings will fail to deliver on their design promise. As panel discussed the competence of designers will be critical in ensuring high-performing buildings and it will be them who should lead on ensuring true value engineering. CJ

"Legislation requires us to build bridges across the different disciplines and we are changing as designers in the way we look at this communication" – Ana Santos, Aecom

"We must value engineer, not cost cut, and do it at an early stage. Well-informed clients make this process easier, but competent designers should take the lead" – James Warne, Inhabit

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Cooling & Heating

Annual event highlights importance of cooling

World Refrigeration Day promotes best practice and cooling as a career choice for schoolchildren

Next-generation cooling and why cooling matters in our rapidly changing world was the theme of the 2023 World Refrigeration Day, which took place on 26 June, as *CIBSE Journal* went to press.

The programme for the day included a webinar on the importance of keeping your condensers clean, highlighting that dirty condensers are one of the biggest contributors to excess energy use in refrigeration systems.

There were also talks on apprenticeships and promoting careers in the cooling sector to schoolchildren.

The first European Women in Cooling video competition, organised by the Air conditioning and Refrigeration European Association in partnership with World Refrigeration Day, was won by French refrigeration engineer Léana Khaled Payan. Entrants provided a 10-minute video that could be used to encourage more women into the refrigeration sector.

ASHRAE pledged its support for the day, the theme of which aligns with its commitment to advancing cooling system technology to address global challenges.

Dubai's Swiss Tower cuts energy use by 60% with fan retrofit

A fan retrofit project in Dubai's Swiss Tower has resulted in an impressive 60% reduction in energy consumption.

The building is continuously supplied with fresh, cooled air from four air handling units (AHUs). However, the system was outdated and had high energy costs.

HVAC specialist company Qey implemented its MatrixAir+ EC fan package, installing 26 EBM-Papst RadiPac fans with EC technology in a FanGrid configuration in the intake and outlet section of the building's AHUs.

The retrofit improved system reliability and extended the system's service life. Collaborating with energy efficiency services firm Taka Solutions, a customised control schedule optimised building ventilation based on capacity utilisation throughout the day.

Panasonic enhances Etherea range with nanoe X Mark 3

Panasonic Heating & Cooling Solutions has launched its Etherea ZKE series for the residential sector.

The new range is equipped with Panasonic's latest nanoe X Mark 3 technology. It produces hydroxyl radicals, which Panasonic says play a crucial role in inhibiting pollutants, allergens, viruses, bacteria, and even odours.

The Etherea ZKE series has an energy ranking of up to A+++ in both heating and cooling, and a noise level of just 19dB(A), ensuring a peaceful environment.

The range is available in single and multi-split, from 2.05kW to 7.10kW, and the graphite grey units have a new capacity of 4.2kW.

Mitsubishi Electric upgrades commercial ventilation system

Mitsubishi Electric has launched the LGH-RVX3-E Lossnay mechanical ventilation with heat recovery system, to provide access to clean air in commercial buildings.

The LGH-RVX3-E system extracts stale indoor air and replaces it with fresh filtered air from outside.

The units can be installed vertically to allow for use in more spaces.

Enhanced controls, with five different levels, allow for optimal efficiency, and fan speeds can be adjusted in 5% increments to allow less energy to be used where possible.

The system is also designed to operate at ultra-low noise levels.

Alternative reality

Engineers and manufacturers must take a proactive approach to breakdown the barriers to widescale adoption of low global warming potential refrigerants, says Mott MacDonald's Grisha Grebennikov

As an industry, we work with a multitude of systems that contain refrigerants and, in recent years, there has been growing concern about the part they play in global warming.

Global warming potential (GWP) is a measure of how much a substance contributes to global warming over a specific timeframe compared with carbon dioxide (CO_2). Higher GWP values indicate a stronger greenhouse effect.

High-GWP substances such as hydrofluorocarbons (HFCs) and chlorofluorocarbons (CFCs) have been widely used in refrigeration and air conditioning systems, but are known to have a significant impact on climate change.

A number of global regulations aim to phase out high-GWP refrigerants, including the European Union's F-Gas Regulation, which focuses on banning high-GWP refrigerants. From January 2025, there will be a ban on refrigerants with a GWP greater than 150.

Furthermore, there is a HFC-specific target that aims to reduce its use by more than 80% by 2030.

The recently introduced *TM65: Embodied carbon in building services: a calculation methodology* also considers the impact of refrigerants in the carbon life-cycle of HVAC building systems.

There are a number of low-GWP alternatives available on the market, such as HFOs, CO_2, ammonia and various hydrocarbon blends, which can act as direct replacements in existing and future refrigeration systems. They are not yet widely available, however, and there are key issues to consider (see panel, 'Key considerations for low-GWP refrigerants').

To accelerate the delivery and acceptance of these alternative refrigerant and equipment manufacturers, industry associations must work together to develop common standards, share best practice, and foster innovation and research.

HFO blends such as 448A and 449A can be used in systems as like-for-like replacements for HFCs. Natural refrigerants, such as CO_2 and ammonia, may be more often used in larger commercial and industrial refrigeration and heat pump applications, while hydrocarbon-based refrigerants are more likely to be used for smaller domestic refrigeration and reversible heat pump systems.

As the demand for alternative refrigerants increases, it is expected that the market position will improve, with more regulations forcing their uptake. For instance, HFO 1234yf, which is a popular variant for automotive air conditioning systems, could be used widely if regulations allow it.

While the initial costs of HFOs and natural refrigerants may be higher compared with conventional refrigerants, long-term energy savings, regulatory compliance, and environmental benefits can offset these costs over the lifespan of the refrigeration systems.

We know refrigerants with high GWP have a negative effect on global warming, and phasing them out will be key to meeting global net zero targets by 2050.

For there to be a meaningful uptake of lower-GWP refrigerants across all sectors, it is incumbent on project teams to identify how this can be achieved and to realise the benefits of more environmentally friendly products for their scheme designs.

GRISHA GREBENNIKOV
is a net zero carbon consultant at Mott MacDonald

KEY CONSIDERATIONS FOR LOW-GWP REFRIGERANTS

Flammability: CFCs, HFCs and hydrochlorofluorocarbons (HCFCs) are considered non-flammable compared with some HFOs, ammonia, propane and isobutane, which have varying degrees of flammability.
Toxicity: Varying degrees of toxicity for HFOs and ammonia, propane and isobutane require protective measures, such as suitable leak detection and enhanced storage precautions. CO_2 is not considered toxic.
Costs: HFOs tend to be more expensive (10 times more than HFCs) because of the current demand. Natural refrigerants are often less expensive than traditional refrigerants, but system costs may be higher because of the requirement for additional components and system adaptation.
Adaptability with existing systems: HFOs are very versatile and can be used with HFC-based systems. However, natural refrigerants require substantial system modifications because of operational pressure, material compatibility and safety.
Trained personnel: Engineers and technicians may require additional training and qualifications to operate with HFOs and natural refrigerants.
Changes to regulation: Future regulations may focus on establishing stricter requirements for leak prevention, detection and disposal, and minimum energy efficiency standards on refrigeration equipment. Revised EU regulations are expected in early 2024.
Impact of manufacturing: The production process for HFOs involves chemical synthesis that also produces carbon, which should be evaluated.
Residual reactions: Ammonia is known to react with acidic compounds in the atmosphere and form particulate matter (PM 2.5), which has implications for air quality and human health. Furthermore, it can contribute to the formation of acid deposition (acid rain). Hydrocarbon-based refrigerants may undergo reactions to form photochemical smog (ozone). HFOs break down in the atmosphere to create high-GWP chemicals and produce TFA – a persistent chemical.
Ozone-depletion potential: As well as the GWP, ozone depletion potential needs to be considered (although it does not have a direct effect on global warming). HFCs, HFOs and natural refrigerants do not affect ozone depletion.

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PROTECTING BUILDINGS FROM WILDFIRE SMOKE

With wildfires recognised as an 'emergent risk' in the UK, what can be done to HVAC systems to mitigate the impact on the health of people in buildings? **Phil Lattimore** looks at the worldwide effect of wildfire smoke

New York's sky turns orange under the impact of recent wildfires in Canada

As global temperatures increase, the impacts of hotter, drier weather are expected to result in more frequent heatwaves and a greater incidence of wildfires over the coming decades.

A report published in 2022 by the United Nations Environment Programme, *Spreading like wildfire: the rising threat of extraordinary landscape fires*, forecast that, even if greenhouse gases are reduced, there could be up to a 50% increase in wildfires across the globe by the end of the century, spanning the Arctic and central Europe to tropical rainforests and the Amazon.

Wildfires pose a growing risk to people in homes, offices and other premises through their impact on indoor air quality (IAQ) and, thereby, people's health. Developing mitigation strategies for maintaining IAQ – including the adaptation or upgrading of air conditioning systems in buildings – is increasingly important.

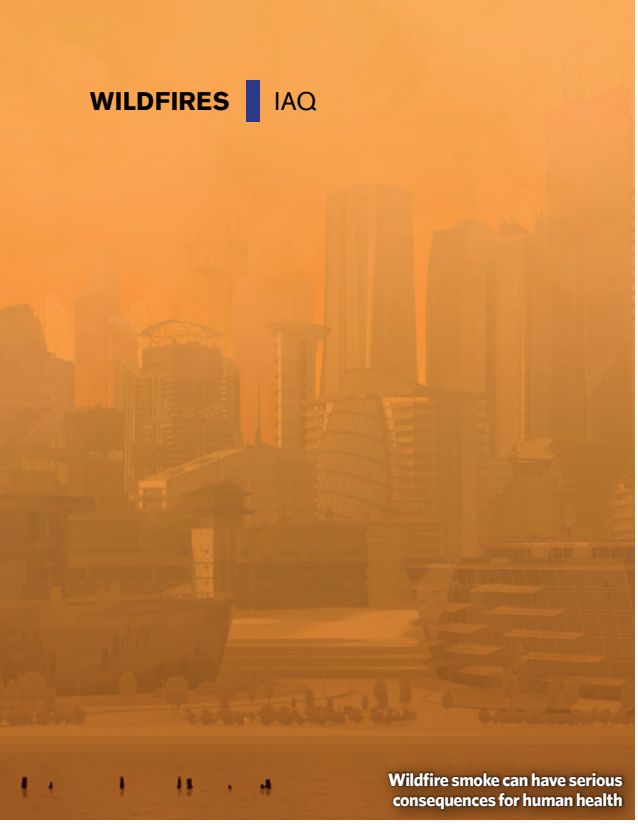
Over the past two years, record temperatures in the UK and other parts of Europe, combined with long periods of intense heat, have resulted in an unprecedented incidence of severe wildfires. Only last month, a wildfire covering around 40 hectares on Rhigos mountain, in Rhondda Cynon Taf, was one of several in the region that caused significant damage and posed a potential health hazard to locals.

It is anticipated that such fires will become more prevalent; research published by Met Office scientist Matthew Perry in 2022 concluded that wildfires can be considered an 'emergent risk' for the UK, and he predicted a large increase in hazardous-fire weather conditions in summer that may extend into autumn. In the US, where wildfires are a perennial issue, data from the Environmental Protection Agency (EPA) suggests there have been large increases in areas burned by wildfires since the 1980s. It estimates that the average area burned in the west of the country will increase by 54% by 2050 as a result of climate change.

The health impact

A recent paper on wildfires (**bit.ly/CJBerkWF**) from the Indoor Air Quality (IAQ) Scientific Findings Resource Bank of the Lawrence Berkeley National Laboratory (supported by EPA funding) highlights some of the key issues for public health, and potential mitigations through ventilation interventions. In terms of health impact, wildfire smoke can cause large increases in outdoor airborne particles, as well as substantial increases in gaseous air pollutants, such as carbon monoxide, nitrogen dioxide, formaldehyde and acetaldehyde. These can spread over thousands of kilometres, which means forest fires can also have an impact in urban environments, increasing the concentration of fine particles significantly.

According to the EPA, the biggest threat from wildfire smoke is from fine particles (2.5 micrometers in diameter [PM2.5] or less). These can enter the eyes or respiratory system, where they can cause significant health problems, from irritated eyes to lung illnesses and cardiovascular problems. They can be particularly hazardous for older people, young children, and those with underlying health conditions. Researchers (Johnston et al) have estimated that landscape fires, consisting of wildfires and prescribed burns, cause 339,000 premature deaths per year globally. »



Wildfire smoke can have serious consequences for human health

» As wildfire smoke with fine particulates and gases can enter buildings through natural ventilation, mechanical ventilation and infiltration, preventative measures and mitigation can be effective. Steven J. Emmerich is a mechanical engineer in the Energy and Environment Division at the US's National Institute of Standards and Technology. He says either the smoke has to be kept out or removed when it gets in. 'Keeping smoke out can be achieved through the combination of a tight building envelope, maintaining a positive building pressure, reducing outdoor air intake to a minimum and filtering the outdoor air,' he says.

Apart from the obvious advice of closing doors, vents and windows in the event of a wildfire, the operation of high-efficiency indoor particle filtration systems (see CIBSE air cleaning technologies guidance at www.cibse.org/knowledge) is recommended by the EPA, as well as by members of the UK's Airbods research group. 'Removing the PM2.5 when it gets in means using better filtration in recirculating HVAC systems,' says Emmerich. 'Many building owners and operators can take advantage of efforts they made to improve building filtration during Covid-19.'

Measures to consider include disabling economisers and demand-control ventilation, verifying what level of improved filtration a building's systems can employ, and, potentially, rigging temporary filtration of outdoor air intakes.

A number of practical steps to mitigate the impact of wildfire smoke are also recommended by the EPA. If the HVAC system has a fresh air intake, this should be closed or the system turned to recirculation mode. For mechanical ventilation systems, it is important to ensure the correct pre-filters and filters are in place. A MERV 13 filter or one with as high a rating as the system's fan and filter slot can accommodate is recommended by the EPA (see **bit.ly/CJEPAfilter**). Filters that can stop finer particulates generated by wildfires – for example, 1 micrometers (PM1) – are available from specialist filtration solution suppliers.

If the building operates an evaporative cooler, this should be avoided in smoky conditions, says the EPA, as it can draw more smoke inside the building. Other options, such as fans or window air conditioners, should be considered.

A portable air cleaning solution can also be effective in mitigating the impact of smoke. Among studies mentioned in the Berkeley Lab paper, two found that air cleaners in homes reduced PM2.5 by around 65%, and by 63% to 88%, during wildfires.

Preparing for the impact of wildfires is very important, and ASHRAE has published a framework that Emmerich says offers practical help with an often overlooked aspect – making a plan. 'Part of that is returning to normal operations after the wildfire smoke episode is over,' he says. CJ

AUSTRALIAN WILDFIRES: HEALTH IMPACT

Australia's 'Black Summer' of wildfires in 2019-20 was one of the worst wildfire seasons on record, causing immense destruction – and the full impact on health from smoke is still being assessed by researchers. The fires in eastern Australia consumed 24 million hectares of land and killed 33 people, with the resulting smoke estimated to have contributed to a further 429 deaths. Studies looking at the impact of smoke inhalation in Australia and the US indicate that wildfire smoke can lead to premature labour, low birth weight, impaired lung development, and higher use by children of some prescription drugs. Studies in Australia is looking into the long-term impacts of these wildfires; one doctor told Bloomberg (bit.ly/CJWFhealth23)that, at the height of Black Summer, walking in Sydney would have been equivalent to smoking 37 cigarettes in a day.

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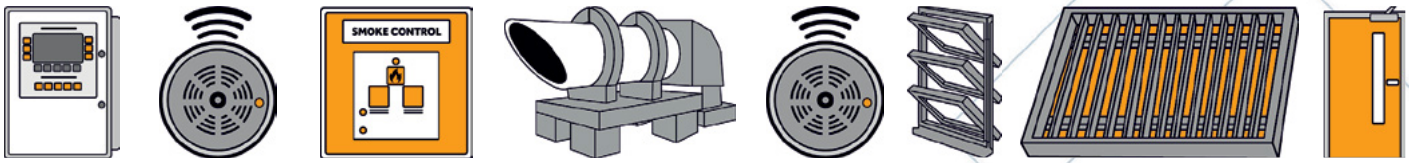

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Exemptions to fire safety regulations do not fully recognise the complexity of modern building façades

FIRE AND FAÇADES: KEY GUIDANCE

To ensure the fire safety of building façades, designers should pay special attention to firestopping. CWCT's **David Metcalfe** highlights the latest guidance on this key area and rounds up the most recent information on designing fire-safe façades

The main fire safety focus for building façades in recent years has been on material reaction to fire, but passive fire protection measures, such as firestopping, are critical, and have potential implications for façade design. The latest guidance addressing the challenges of fire safety in façade design are as follows:

Regulation 7 guidance

Changes made to Regulation 7 of the Building Regulations in November 2018 implemented the so-called ban on combustible materials in England. This legal requirement is deliberately simple and, with limited exemptions, requires all materials used in the external walls of certain high-rise buildings ('relevant buildings') to achieve class A2-s1, d0 fire rating or better.

While the regulation itself is simple, modern building envelopes are not. It quickly became apparent that additional guidance was required to provide a consistent interpretation of the regulation. Key to the regulation are the exemptions that are provided; however, the exemptions do not fully recognise the complexity of modern façades, and leave some ambiguity and uncertainty over combustible materials that may or may not be used, and in what circumstances they may be used.

The Centre for Window and Cladding Technology (CWCT) and the Society of Façade Engineering (SFE) collaborated to publish guidance in September 2020, after widely consulting with a range of industry professionals (see 'Tall Order', *CIBSE Journal*, October 2020). It has helped provide much-needed consistency.

The intention was always to update the document and feedback from readers was invited from the start. The updating process started after the revision of the regulation and Approved Document B (ADB), published in June 2022. It is testament to the effort that went into the original guidance that only minor revisions have been required. In addition to recognising the changes the amendments introduced, further guidance and clarifications were made in relation to testing, waterproofing at interfaces with balconies, parapets, fixings and external shading devices.

While the exemptions acknowledge the vital role that certain combustible materials currently play in the performance of modern façades, it is important to recognise that the industry has responded to the 'ban' and developed new materials that meet the regulation. Where such materials exist without compromising other aspects of performance, it will almost always be appropriate to use them in »

CURTAIN WALL FIRESTOPPING

CWCT's proposed approaches to curtain wall firestopping

1. **Test in accordance with EN 1364-4 and use the firestop within the field of application of the test.**
2. **Test in accordance with EN 1364-4 and use the firestop within an extended field of application; can use guidance given in EN 15254-6.**
3. **Detail the firestop based on a fire engineering assessment; this would take account of other mitigating measures – for example, the use of sprinklers in the building and the evacuation strategy.**

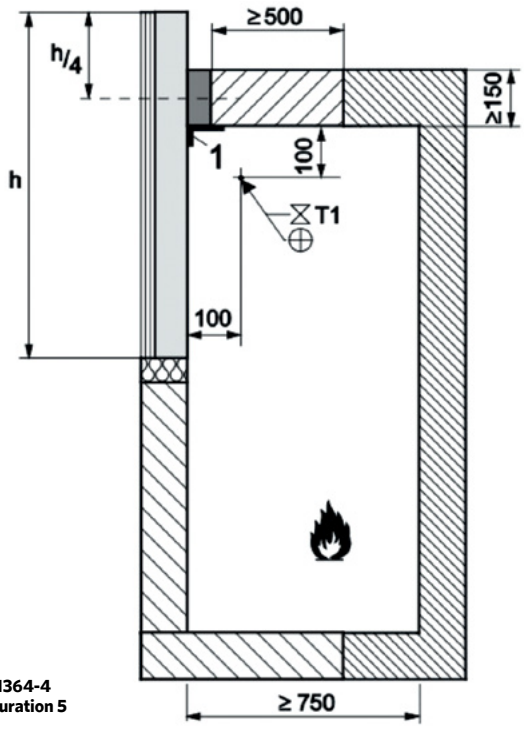

Figure 1: BS EN 1364-4 standard configuration 5
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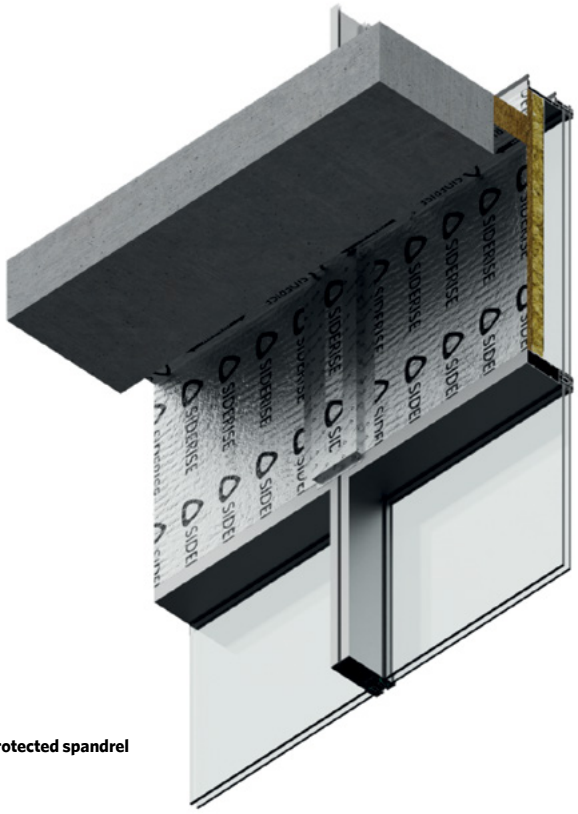

Figure 2: Protected spandrel
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» preference to a more combustible alternative. The revised guidance will be soon be freely available on the CWCT website (**www.cwct.co.uk**).

Further CWCT guidance

The update described above is one part of a wider review of existing CWCT fire guidance. CWCT Technical Note 98, published in April 2017, is also being revised. In addition to reaction to fire, this technical note covers other key aspects of façade fire performance, including cavity barriers and firestopping.

Reaction to fire

While Regulation 7 provides new legal requirements for certain buildings ('relevant buildings'), the guidance related to other types of buildings is still a source of confusion and potential ambiguity.

In terms of reaction to fire requirements, several interpretations are possible, which would influence the materials that meet the guidance in ADB (what is a 'filler material'; which materials constitute the 'external surface'; and so on). Reasoned argument and common sense are required to interpret the recommendations contained within ADB in such a way that a logical conclusion is reached that demonstrates compliance with the regulation. We are working with government to provide a consistent approach to applying the guidance.

Compartmentation and curtain wall firestopping

It is well established that firestopping is required between curtain walls and compartment walls and floors. Such firestopping should provide the same period of fire resistance as the floor or wall to which it abuts. However, curtain walls are not generally required to be fire-resisting,

> "The exemptions do not fully recognise the complexity of modern façades and leave some ambiguity and uncertainty over combustible materials"

and research carried out by the Loss Prevention Council (LPC) showed that failure of curtain walls in fire could occur within 15 minutes, potentially allowing fire to bypass any firestopping.

This, together with a lack of specific test methods for curtain wall firestops and limited guidance in ADB, has resulted in the use of firestops that have been tested between rigid materials with little consideration of the effect of the curtain wall on the performance of the firestop.

The need to review the fire safety of façades following the Grenfell Tower fire – along with the development of standard test procedures for curtain wall firestops and the focus on satisfying the functional requirements of the Building Regulations, rather than merely following ADB guidance – requires a reappraisal of established practice.

A number of approaches to testing firestops have been used in the past, including ad hoc tests based on the principles of BS 476, BS EN 1366-4 and, more recently, BS EN 1364-4.

It is proposed that references to testing in accordance with BS 476 be dropped from ADB, thereby removing the option for ad hoc testing following the principles of BS 476. Such tests generally involve testing the firestop between rigid fire-resisting materials, so are unlikely to represent the performance in conjunction with a curtain wall.

BS EN 1366-4 has been used for testing curtain wall firestops. However, it was amended in 2021 to exclude perimeter seals of curtain walling from its scope.

BS EN 1364-4 gives a method of testing curtain wall firestops that can be applied to curtain walls that are not fire-resisting, although fire protection of the inner face of the curtain wall in the

spandrel zone is required to allow the test to be carried out.

The Association for Specialist Fire Protection has issued guidance that states BS EN 1364-4 is the only appropriate test for curtain wall firestops. BS EN 1364-4 has a range of test configurations depending on the requirements of the test. For testing the junction between the curtain wall and the floor, configuration 5 is appropriate (see Figure 1). In this set-up, the firestop, and the section of the curtain wall immediately below the firestop, are exposed to a furnace. The specimen would normally be the height of a spandrel panel with a transom at top and bottom. The part of the sample exposed to the furnace will require fire protection to enable the test to be carried out.

Although the BS EN 1364-4 test is more representative of the performance of the firestop than tests with rigid fire-resisting construction, configuration 5 still does not fully represent the situation in a real structure. For example, the underside of the transom at the bottom of the sample and the outer face of the sample are not directly exposed to the heat of the fire.

The field of application rules mean that fire protection of the internal face of the curtain wall will also be needed in the spandrel zone in project installations, as shown in Figure 2.

In 2022, CWCT convened a group representing the façade industry, together with fire experts, to discuss issues relating to the fire performance of façades. At this meeting, the consensus was that CWCT should adopt the use of BS EN 1364-4 as the recommended method for testing firestops. CWCT is proposing three potential approaches to curtain wall firestopping (see panel, 'Curtain wall firestopping').

The recommendation to use firestops tested to EN 1364-4, and using them within the field of application rules given in the standard, may make use of previous test results, but might require project testing.

Use of existing test data would limit the design of the curtain wall, as it would have to fall within the field of application rules of tested arrangements. Project testing would incur additional cost and would require decisions to be made earlier in the procurement process to provide time for testing without delaying the project.

Conclusion

Further guidance related to the fire performance of building envelopes is required to help ensure that safe façades are designed and constructed. Providing such guidance remains a challenge because of there being no consensus on the approach that should be taken, a lack of experience in this area, and the understandable conservatism that exists with anything fire-related at present. Organisations such as the CWCT and the SFE are working hard to provide this much-needed, clear, practical and pragmatic guidance. CJ

DAVID METCALFE is director of CWCT and chairs the Society of Façade Engineering Fire committee

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OPEN TO MISINTERPRETATION

Accurate definition of the size of openings is critical to the performance of a building's natural smoke and heat ventilation system, says Trigon's **Sam Bader**, but a lack of clarity in guidance is causing confusion

While the UK fire safety industry commonly provides natural smoke and heat ventilation systems (NSHEVs) within buildings, the terminology used to define NSHEVs in standard guidance and fire safety documentation can be inaccurate and ambiguous.

Accurate definition of the size of openings is critical to performance, particularly given the likelihood of misinterpretation increasing as responsibility for the system changes throughout planning, design, specification and installation. Are we installing NSHEV systems with different and, in the worst case, smaller openings than intended?

Smoke and heat exhaust ventilation systems are used, in the event of fire, to remove the smoke and heat in the buoyant layer of warm gases above cooler and cleaner air, thereby improving the tenability conditions during means of escape and firefighting phases. These systems prevent flashover, protect property, and reduce the damage of heat and gases to a building.

Original building smoke ventilation systems were natural, and while alternative solutions for ventilating smoke now exist (mechanical extract, pressurisation and hybrid systems), aspects of natural smoke ventilation can be found within almost all buildings. As natural smoke ventilation is so common, it is important that the parties responsible for smoke ventilation systems – including designers (such as fire safety engineers and architects), manufacturers, installers, and maintenance engineers – are coherent in specifying them, to ensure the building meets the design intent and achieves its life-safety objectives. All those involved with smoke ventilation systems should understand the complexities in defining their performance.

This article has implications for all smoke ventilation systems, but will only refer to NSHEVs achieved via vents opening directly to outside. Furthermore, it will not focus on the application of NSHEVs, but on their design and performance, including how smoke and heat modelling translates to its application.

Defining area openings

This article proposes the following definitions for the geometric free area, aerodynamic free area, and coefficient of discharge (as specified in BS 7346-8 and BS EN 12101-2):

- **Geometric area** is the area of the opening through an NSHEV measured in the plane defined by the surface of the construction works, where it contacts the structure of the NSHEV.
- **Aerodynamic area** is the geometric area multiplied by the coefficient of discharge.
- **Coefficient of discharge** is the ratio of actual flowrate, measured under specific conditions, to the theoretical flowrate (geometric area) that occurs through the NSHEV.

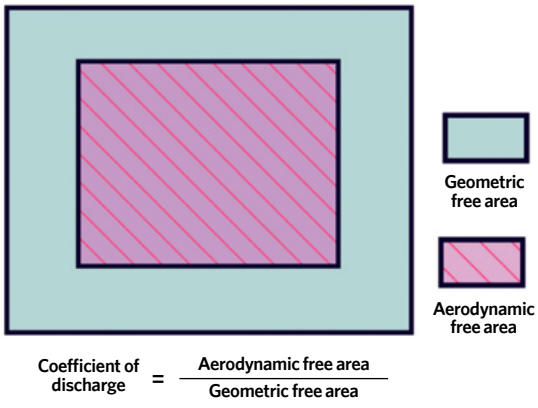
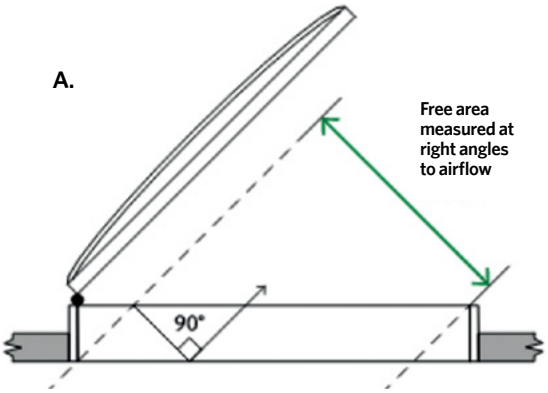


Figure 1: Relationship between geometric free area, aerodynamic free area and coefficient of discharge



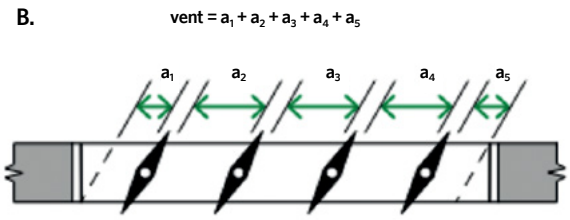


Diagram D7 Free area of smoke ventilators

Figure 2: Diagram D7 extracted from ADB:V2

» The relationship between the terms identified above are illustrated in Figure 1. A number of other terminologies are used within the industry. For example, Section D5 Approved Document B: Volume 2 (ADB:V2) specifies 'the free area of a smoke ventilator should be measured by:

a) The declared aerodynamic free area in accordance with BS EN 12101-2; **or**

b) The total unobstructed cross-sectional area (geometric free area) measured in the plane where the area is at a minimum and at right angles to the direction of airflow (Figure 2).

However, this diagram does not illustrate how a vertical hinged NSHEV 'free area' is calculated for this application, introducing ambiguity. ADB:V2 defines the size of openings as 'free areas' or 'permanent openings'. Similarly, BS 9999[4] refers to cross-sectional area (free area) and geometric free area when defining minimum sizes for vents/shafts within buildings. This is ambiguous, as one NSHEV of specified 'free area' could have a range of different aerodynamic free areas depending on the coefficient of discharge, which can only be defined by testing the system.

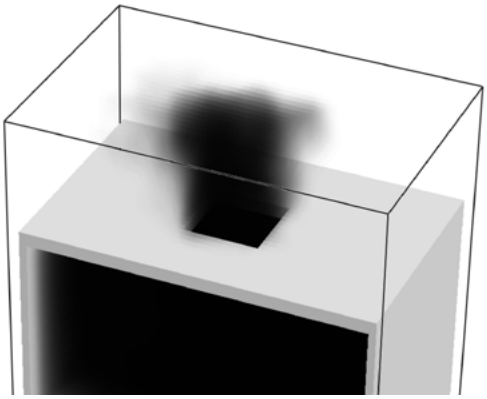


Figure 3: CFD model of an NSHEV in FDS

There is a lack of clarity in the guidance, with references to geometric free areas, permanent openings, or even 'cross-sectional area'. This terminology does not provide performance criteria. Perhaps these documents should align their terminology by using the aerodynamic area to define the performance of an NSHEV, as recommended by the SCA *Guide on heat exhaust ventilators*.

The size of openings in NSHEVs must also be clear. Fire safety engineers increasingly undertake computational fluid dynamics (CFD) studies. With graphical user interfaces such as PyroSim for Fire Dynamics Simulator (FDS), heat and smoke modelling has become easier – but does the modeller understand the intricacies of the model? The modeller should accurately represent the size of the NSHEV opening, as specified in the fire safety strategy information, and specify this in the CFD report. It is common to find CFD reports specifying 'free area' or 'geometric free area' without definition.

With FDS, for example, it is understood that an opening in a wall or ceiling (used to represent an NSHEV) does not incorporate a coefficient of discharge. By introducing a hole, the performance efficiency of 60% or less (approx.) is not incorporated (a hole would have 100% efficiency, so the model would overestimate the NSHEV's performance). So, it is proposed that an opening within an FDS model represent a hole of aerodynamic free area rather than geometric free area, as identified in the SCA guide.

Terminology should be accurately defined within the fire safety documentation, which should be agreed upon at an early design stage. Aerodynamic free area should be considered to define natural smoke ventilation opening sizes as a precise measurement that reduces ambiguity throughout building development. CJ

SAM BADER is a fire engineer at Trigon Fire Safety

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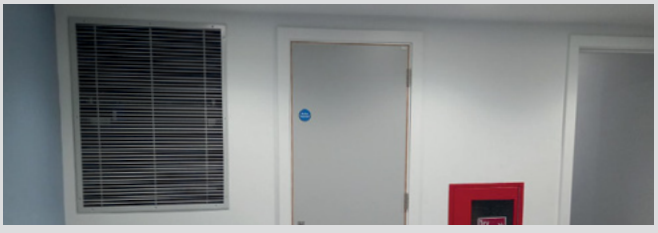

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Arup's recent collaboration with design architect SANAA and executive architect Architectus, the 6-star Green Star design-rated Sydney Modern extension to the Art Gallery of NSW, has conventional wet sprinklers to back-of-house spaces, and pre-action sprinklers installed throughout the galleries and art-storage areas (© Art Gallery of New South Wales, Jenni Carter Iwan Baan)

DOUSING FIRE FEAR IN MUSEUMS

Museum owners are wary of fire sprinklers in sensitive spaces, but Arup's **Jake Cherniayeff** says they should be considered along with gaseous suppression and innovative hybrid mist and nitrogen systems

Public museums must be safe for their staff and visitors, as well as for the valuable collections of artworks, artefacts and sculptures they hold. Fire protection systems have a major role to play in keeping these buildings, their contents and occupants protected.

Given the complex and bespoke nature of museums, there is no 'one size fits all' approach to designing active fire-suppression systems. The design is usually a collaboration between the fire services and fire safety engineers, architect, structural engineer and the wider design team. It is often performance-based and outside the 'deemed to satisfy guidance' of regulatory standards, which do not cater for each and every condition.

Sprinkler systems should be the starting point for active fire suppression in buildings. They are proven to control fires and have done for more than a century. Globally, however, the common view of museum operators and their art-lending teams is that wet services in art spaces should be avoided. In a survey Arup conducted of 16 Australian museums built in the past 25 years, nine (around 56%) were protected with sprinklers, while seven (around 44%) were not. Of those that were protected, only four (around 45%) were required to be by the Australian National Construction Code.

Concern over sprinklers are born of a misconception that activation typically results in a deluge, drenching the whole room and its contents. It is incumbent on the design team to guide museum clients and stakeholders about the actual risks.

US studies suggest that false activation of sprinkler heads occurs at a rate of around one in 16 million heads annually. Assuming a sprinkler head is accidentally damaged and discharges 70 litres per minute (typical AS2118.1 light-hazard sprinkler flowrate suitable for museums with low combustible loading) in a gallery space for 10 minutes – allowing facilities management to investigate and isolate the sprinkler system – this would result in 700 litres of water in the gallery.

If the gallery floor area is 2,000m², this water will pond around 350mm off the floor, well below the typical wall art hanging height. Of course, there are other considerations, such as how the water will be removed from the gallery and the risk of it draining into areas adjacent and below the flooded space.

Should permanently charged wet pipework still cause concern, double-knock pre-action systems are a sound alternative, where the pipework within the space is charged with nitrogen or an inert gas, with an electrically latched valve requiring both the fire detection system and a sprinkler head to be activated simultaneously to discharge water into the space, thereby reducing the risk of false activation through physical damage.

These systems do introduce some challenges in museum buildings. Code (and good practice) requires a gradient on the pipework to permit proper drain down of the system to remove moisture and reduce risk of pipework corrosion. Coordinating this requirement can be a challenge in gallery spaces that are heavily serviced at ceiling level, have restricted ceiling zones, and with constantly changing exhibits.

Hybrid water mist and nitrogen systems are an exciting development in fire-suppression technology and should be considered owing to their significant reduction in water discharge. This technology is relatively new, however, and not yet permitted by building codes as a 'DTS' solution in spaces with high ceilings and air change rates typically found in modern galleries.

These systems also introduce additional controls and valving, meaning more single points of failure.

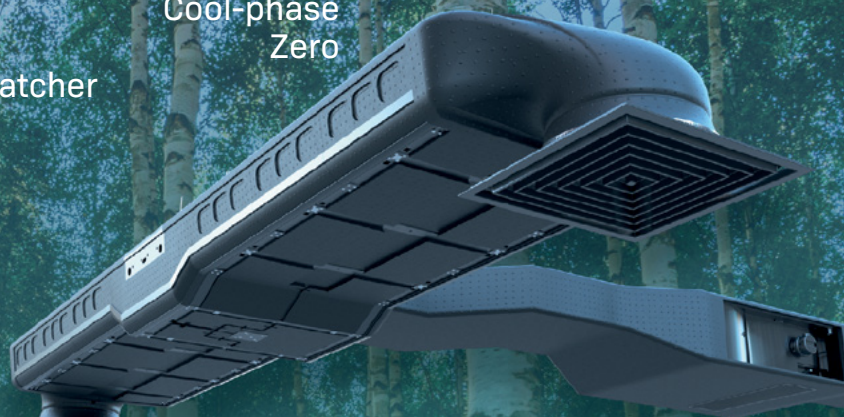
The high upfront and ongoing costs of gaseous suppression systems often don't make economical or environmental sense for large gallery spaces, but do have a place in art-storage areas, where collections are often stored in high-density art racks. These rooms have close environmental controls commensurate with the sensitivity of the items they house. Accidental or intended sprinkler discharge in these rooms can have catastrophic outcomes – a small electrical fire setting off one sprinkler at 70 litres per minute in a 50m² space would drench the room and its contents.

Hybrid water mist and nitrogen systems should be considered for art-storage spaces. due to their significant reduction in water discharge. Shielding or enclosed racking can be useful, but there needs to be hydraulic and fire engineering analysis to validate the effectiveness of the overall solution.

The optimal outcome for each gallery and art-storage space will be informed not only by local building regulations, but also by maintainability, upfront and ongoing costs, environmental impacts and a thorough understanding of how each space will be used over the building's life. CJ

JAKE CHERNIAYEFF is Arup Australasia hydraulic and fire services skills leader

Windcatcher Zero



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Wintertime optimal ventilation heat recovery for MVHR

This module explores the optimisation of wintertime performance of mechanical ventilation and heat recovery (MVHR) solutions through modelling of a variety of building applications

The overall performance of mechanical ventilation and heat recovery (MVHR) units is dependent on a combination of (sometimes opposing) requirements that need to be holistically considered to determine the correct application. This CPD will explore the sensible heat recovery efficiencies required from MVHR units for a variety of modelled commercial and institutional building applications in a temperate climate, in order to better understand what should be applied for optimum wintertime performance.

Driven by legislative obligations, such as the Ecodesign regulations (see panel), and the escalating necessity of environmental responsibility, building owners and industry professionals are increasingly installing some form of heat recovery device on all sizes of ventilation systems.

In the typically compact form that makes up a MVHR system (as in the example shown in Figure 1), the type of heat recovery that is generally employed is a plate heat exchanger. Some systems employ heat pipes for heat recovery, and in larger MVHR units it would not be unusual to see a thermal wheel or, occasionally, a run-around coil.

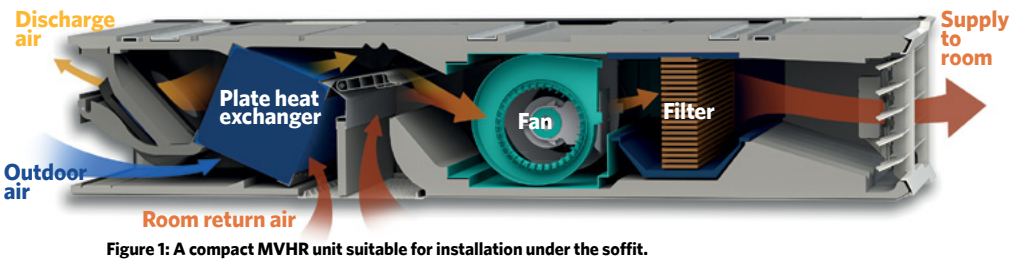

Figure 1: A compact MVHR unit suitable for installation under the soffit. This includes a cross-flow plate heat exchanger (Source: Monodraught)

During winter, an occupied building's indoor air is heated by the casual gains of occupants, appliances, lighting, equipment and solar gain, as well as any heating system. An MVHR unit is primarily used to deliver ventilation air from outdoors to maintain good indoor air quality (IAQ).

The heat exchanger in the MVHR transfers heat from a building's vitiated exhaust air to the incoming outdoor air, to raise (or lower) the temperature – and, in some cases, moisture content – of the incoming air. This reduces or negates the need to add, or remove, sensible and, possibly, latent heat. When designed, installed and operated appropriately, these can deliver significant life-cycle energy savings, since the power required to operate the heat exchangers – normally as a result of the need for additional fan power, as the heat exchanger adds resistance to the airflow path – can be substantially lower than the power that is gained from the transfer of heat between the fresh air and the exhaust air.

Systems with high heat recovery efficiency tend to have a much lower ventilation flowrate efficiency, as the heat exchangers create significant resistance to airflow. This means that when the heat recovery is not fully required or used, the efficiency of the systems suffers owing to the increased »

THE ECODESIGN REQUIREMENTS FOR MVHR

Great Britain (England, Scotland and Wales) embodied the EU requirements in the UK Ecodesign for Energy-Related Products and Energy Information Regulations 2021 (ErP 2021), so practically the EU regulations have relevance across the whole of geographical Europe. EU 1253/2014[1] defines the required performance for non-residential MVHR units that in typical conditions require a minimum thermal efficiency of 73% for plate heat exchangers and thermal wheels, and 67% for a run-around HRS. The basic maximum internal specific fan power (SFP) for the unit is also specified, but with a higher efficiency HRS this may be increased, so encouraging the use of a more efficient HRS.

» resistance to airflow. Many ventilation systems have a bypass airpath to avoid the heat exchanger; however, these are typically sized with the same flowrate efficiency as through the heat exchanger.

Table 1 shows data taken for some example commercial MVHR systems, representing efficiencies for systems of their type. System 1 is a simple balanced flow mechanical ventilator with no HRS; system 2 has a low-efficiency heat exchanger; systems 3 and 4 have high-efficiency heat exchangers (but also include a heat exchanger bypass that has an airflow resistance that almost matches that of the heat exchanger).

The impact of the HRS on the SFP is clear. At one extreme, the system with no HRS can provide ventilation while consuming under 5% of the (internal) fan power compared with the units with a high-efficiency HRS. Systems with lower heat exchanger efficiency have the lower internal SFP. This property of MVHRs seeded the idea for the study that is reported in this CPD, which was undertaken by Kieran Kilgariff, of Monodraught. His study sought to explore the optimum HRS efficiency for a number of example MVHR applications while maintaining room IAQ through supplying outdoor air. To provide some nominal, but reasonably realistic, assessment of ventilation needs, Kilgariff created some simple room models. These included several building room types drawn from the secondary education sector – a general classroom, a science lab, an assembly hall, and a sports hall. Each room was modelled with three different occupancy levels (low, medium and high) to represent typical use cases. For example, the classroom at low occupancy represents a classroom at a special educational needs and disabilities (SEND) school; the sports hall at low occupancy represents a typical physical education lesson and, at high occupancy level, represents it being used as an exam room.

Performance parameters		System 1	System 2	System 3	System 4
Daytime flowrate	$L \cdot s^{-1}$	130	80	135	521
Daytime power consumption	W	6	24	131	687
Heat exchanger efficiency	%	0	42	81	79
Internal SFP (passing through HRS)	$W \cdot L^{-1} \cdot s^{-1}$	n/a	0.3	0.97	1.32
Internal SFP (with bypass open)	$W \cdot L^{-1} \cdot s^{-1}$	0.045	0.053	0.97	1.1

Table 1: Indicative performance of commercially available MVHR units

	Floor area	Room volume	Infiltration rate	Building construction			Occupancy		
	m^2	m^3	Air changes per hour	(U x A) $W \cdot m^{-2}$			(People)		
				Type 1	Type 2	Type 3	Low	Mid	High
Classroom	56	168	0.1	13	28	48	16	24	32
Science lab	80	240	0.1	14	33	62	16	24	32
Assembly hall	300	1,800	0.1	138	176	237	60	100	150
Sports hall	594	4,752	0.1	320	375	455	60	150	250
Large office	375	1,125	0.1	46	138	273	38	50	80
Small office	16	48	0.1	8	28	33	2	4	6
Boardroom	40	120	0.1	17	45	59	10	15	20

Table 2: Basic parameters of modelled rooms

There were three commercial building room types – a large open-plan office space, a small personal office or meeting room, and a boardroom or large meeting room. Each room variant was modelled with three different occupancy levels representing the occupancy densities given by CIBSE Guide A[2] for these room types.

Each educational and commercial room type was modelled with three different building constructions to represent buildings with different thermal performances. Room type 1 represented a room with minimal external façades and glazing; type 3 a room with a high level of external façades and glazing; while type 2 represented a middle ground between the two. Fabric thermal performance was taken from limiting values of the 2021 edition of England Building Regulations AD L Volume 2.[3]

Table 2 provides a summary of the rooms modelled alongside their building constructions (represented by the sum of the U-values multiplied by external area) and occupancy levels.

Each room was modelled using internal temperatures, occupancy gains, lighting gains, equipment gains, and ventilation rates as set out in CIBSE Guide A and BB101.[4] The ventilation heat recovery required to keep each modelled room variant was heat balanced, or in 'thermal equilibrium' – that is, the room heat gains

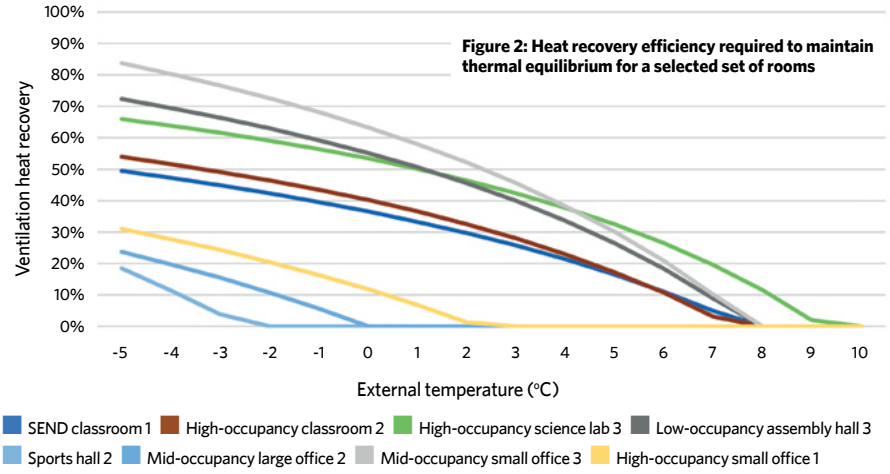

Figure 2: Heat recovery efficiency required to maintain thermal equilibrium for a selected set of rooms

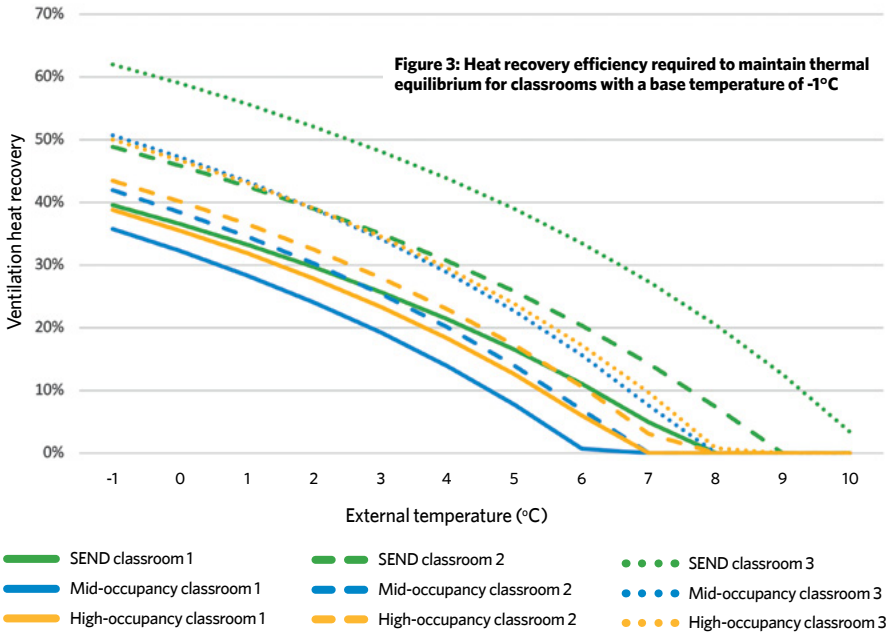

Figure 3: Heat recovery efficiency required to maintain thermal equilibrium for classrooms with a base temperature of -1°C

minus the fabric and infiltration heat losses were balanced by the temperature of the ventilation air being supplied by the MVHR. This was calculated using steady state equations for an external temperature range of -5°C to +10°C. Figure 2 shows a selected set of the room results to indicate the range of ventilation heat recovery efficiencies required to keep the rooms in thermal equilibrium. This indicates that the optimum ventilation heat recovery efficiency varies greatly depending on the occupancy density, building construction and external temperature.

It is common that the effectiveness of ventilation systems' heat exchangers are evaluated at an external temperature of -5°C, as that is one of the standardised test conditions. However, sizing the heat exchanger based on these extreme conditions will impact the efficiency of the systems at all other times. For example, referring to the future predicted weather files[5] for south-eastern England, the external temperature is only expected at -5°C for one typically occupied hour (09:00 to 17:00) throughout the year. If -1°C is used as a representation of extreme external conditions, this would encompass 99.5% of occupied hours.

Figure 3 shows the results for the classrooms with an external temperature ranging from -1°C. The high-occupancy classroom with mid-range building thermal performance shows thermal equilibrium can be achieved with 42% heat recovery at -1°C external temperature. The model of the classrooms indicates that the required heat recovery efficiency increased as the occupancy density and building thermal performance decreased. The same trend occurred for the science labs, although the required heat recovery efficiency was higher and differences more uniform owing to the ventilation rate being based on floor area rather than occupancy. The high-occupancy science lab with mid-range building thermal performance showed thermal equilibrium at 49% heat recovery at -1°C external temperature.

The results for the sports hall varied widely between general sport use and exam/high-occupancy use. While in sport use, and with an external temperature of -1°C, the heat losses resulting from ventilation and conduction are lower than the total heat gains in the room, hence no ventilation heat recovery is required. However, sports hall (exam) with mid-range building thermal performance requires 50% heat recovery.

The modelled output for the commercial offices showed the largest range of required heat recovery, owing to the building constructions ranging from well-insulated to fully glazed façades. The highly insulated variant showed no need for heat recovery, and all other constructions required less than 35% heat recovery. The small office and boardroom models required very little heat recovery where the construction was highly insulated, but in some cases required additional mechanical heat even if all the heat energy was recovered from the exhausted air. This was due to the very high ratio of (poorly insulated) façade area to occupancy density.

Table 3 summarises the heat recovery required to provide thermal equilibrium at an external temperature of -1°C for each of the modelled areas at typical occupancy and mid-level building construction, as well as the percentage of typically occupied hours where any amount of heat recovery is required. This indicates that the required ventilation heat recovery for most cases is less than that required in ErP legislation and, for many cases, heat recovery is only useful for under 20% of occupied hours.

The modelling applied in this study, and reported in this article, takes a simplified broad-brush approach in order to emphasise succinctly the need for further examination. This work suggests that it would be beneficial to consider ventilation systems with lower heat recovery efficiencies and high ventilation flowrate efficiency to reduce building energy use, rather than rely on prescriptive limiting values of heat exchanger thermal efficiency. As shown in Table 3, for much of the occupied period the HRS is not required, and so it is important that heat exchanger bypasses are designed with a low resistance to airflow and controlled robustly, since this path is likely to be used for the majority of the time that ventilation is required for typical buildings.

With thanks to Kieran Kilgariff for the commentary and results from his study that have been lightly edited and reproduced in this article.

Room at mid-level insulated building construction	Heat recovery required at -1°C	Occupied hours requiring heat recovery
SEND classroom	49%	18%
High-occupancy classroom	42%	13%
SEND science lab	69%	42%
High-occupancy science lab	49%	18%
Mid-occupancy assembly hall	48%	13%
Sports hall	0%	0%
Mid-occupancy large office	6%	1%
Mid-occupancy small office	56%	10%
Mid-occupancy boardroom	30%	4%

Table 3: Heat recovery efficiency required to provide thermal equilibrium at an external temperature of -1°C

Turn to page 54 for references

Module 218

July 2023

1. What is the minimum required thermal efficiency for a MVHR plate heat exchanger in the Ecodesign regulations?

- ☐ A 30%
- ☐ B 49%
- ☐ C 56%
- ☐ D 67%
- ☐ E 73%

2. In the south-eastern England future predicted weather files referred to in this article, what external winter temperature would encompass 99.5% of occupied hours?

- ☐ A -1°C
- ☐ B 0°C
- ☐ C 1°C
- ☐ D 2°C
- ☐ E 3°C

3. In the four example commercial MVHR units, which one has the highest internal pressure drop per litre per second?

- ☐ A System 1
- ☐ B System 2
- ☐ C System 3
- ☐ D System 4
- ☐ E Not possible to assess, as they all have different daytime flowrates

4. What approximate heat recovery efficiency is required to maintain thermal equilibrium for the example high-occupancy small office, type 1, when external temperature is -1°C?

- ☐ A 0% to 10%
- ☐ B 10% to 20%
- ☐ C 20% to 30%
- ☐ D 30% to 40%
- ☐ E 40% to 50%

5. In this work, what percentage of occupied hours required heat recovery for a mid-occupancy large office with mid-level insulation?

- ☐ A 0%
- ☐ B 1%
- ☐ C 10%
- ☐ D 18%
- ☐ E 42%

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References:

1 Commission Regulation (EU) No 1253/2014 of 7 July 2014 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for ventilation units.

2 CIBSE Guide A *Environmental Design*, CIBSE 2015.

3 The Building Regulations 2010, AD L2, 2021 edition (2023 amends), HM Government, 202

4 BB 101: Ventilation, thermal comfort and indoor air quality 2018, UK ESFA, 2018.

5 Future weather file for London, Gatwick DSY 1 (moderately warm summer) for 2080, low emissions scenario, 50th percentile – **www.cibse.org/weatherdata**.

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Products of the month

Lochinvar heat pumps boost performance at Devon college

Eight heat pumps are at the heart of institution's net zero building strategy

Eight heat pumps, provided by Banbury-based manufacturer Lochinvar, are helping a leading further education college achieve its ambitious sustainability and low carbon goals.

Lochinvar is facing a steep learning curve as it provides new heat pumps to South Devon College, in Paignton, which is 'putting sustainability at the heart of what we do and making a decade of change'. The college has set an ambitious goal of achieving sustainability and low carbon emissions as part of its 10-year strategy.

To transform its campus into a net zero carbon building, the college recently underwent a major plantroom upgrade with the support of government funding from the low carbon Salix finance initiative. The initiative has provided £2.7bn of public funds to support public sector carbon reduction projects such as this one.

Thanks to the financial assistance, South Devon College was able to upgrade its heating and hot-water system, incorporating eight Lochinvar heat pumps that provide 1.6 megawatts (MW) of heating capacity. This is a significant upgrade to its previous system and aligns with the college's commitment to contribute to the creation of a greener, cleaner, and net zero economy that improves the quality of life for all at the school.

Overcoming the challenges:
Lochinvar collaborated closely with the contractor – Mitie Facilities Management, of Cardiff – throughout the project. Together, they navigated the challenges that were presented by the site's geography and electrical load requirements. The team explored various options to address these challenges and, ultimately, decided on the installation of eight air to water high-temperature Amicus heat pumps, along with two 2,000-litre LBT thermal stores. All of the systems were supplied by Lochinvar.

The Amicus heat pumps, along with the thermal stores, are components of a heating system that uses heat pumps to extract thermal energy from the ambient air and transfer it to water for space heating and hot-water production.

"The college recognises the importance of sustainability and ensures it remains a key focus in its ongoing efforts"

The heat pumps are designed specifically for high-temperature applications, so can generate hot water at higher temperatures compared with standard air to water heat pumps. This makes them suitable for heating systems that require higher water temperatures, such as radiators or underfloor heating systems.

The two LBT thermal stores act as large heat reservoirs, storing the heated water produced by the heat pumps, to be released when needed. The thermal stores help to optimise the operation of the heat pumps by allowing them to work efficiently and store excess heat for later use.

By combining the air to water high-temperature Amicus heat pumps with the LBT thermal stores, the heating system provides a reliable hot-water supply to the college.

One of the major obstacles that was faced during the project was the limited space available on the steep hill where the campus is situated. To overcome this, the team had to employ creative thinking to ensure the heat pump installation could be orientated correctly for successful operation. The heat pumps were installed in a compound adjacent to the building, with four units serving each side of the premises. A plate heat exchanger was used to supply domestic hot water to three existing cylinders.

South Devon College remains committed to continuously improving its sustainability approach. Environmental awareness and responsibility are promoted throughout the college, and sustainability principles are embedded across all levels of governance and leadership. The college recognises the importance of sustainability and ensures it remains a key focus in its ongoing efforts.

By leveraging the expertise of Lochinvar and Mitie Facilities Management, South Devon College has been able to make significant strides towards its sustainability and low carbon goals. The upgrade of the heating and hot-water system using Lochinvar heat pumps demonstrates the college's dedication to its mission to be net zero.

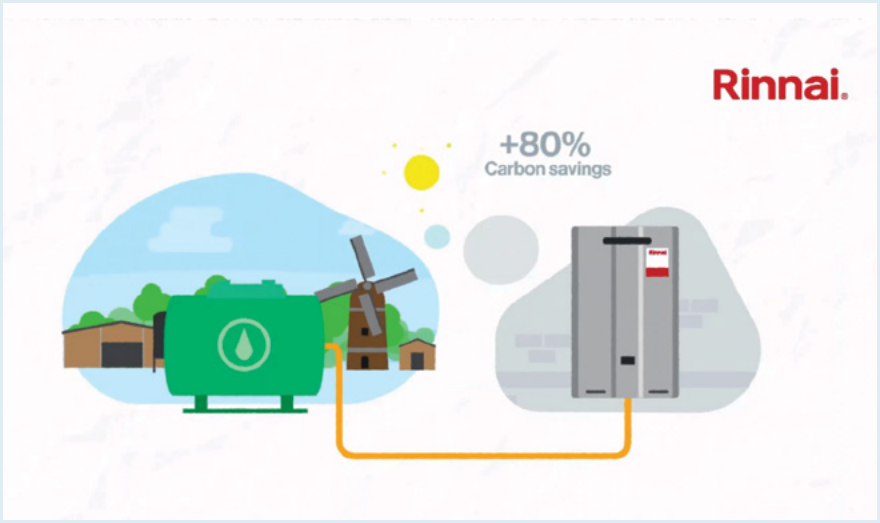
As Lochinvar continues to provide innovative heating solutions, the challenges encountered during this project will contribute to its growing knowledge and expertise in the field. Lochinvar said it was a trusted partner in delivering efficient and environmentally friendly heating systems.

Visit www.lochinvar.ltd.uk

Products of the month

Rinnai unveils free design service for heating and hot-water systems

New initiative allows for systems to be customised to suit the unique needs of a customer's property



Rinnai has unveiled a complimentary customer service that aims to design the ideal heating and hot-water system, tailored to each of its customer's unique property requirements.

The initiative allows for heating and hot-water systems to be customised to individual needs, resulting in significant savings in purchase and running costs, while also making a positive impact on carbon emissions reduction.

Every property has its own distinct characteristics that influence the optimal heating and hot-water delivery system. For example, off-grid rural locations – such as hotels, residential care homes, and health centres – often benefit from specialised solutions, such as hybrid heat pumps or solar thermal systems with BioLPG options. These systems are particularly effective in high-demand settings where heating and hot-water needs are paramount.

On the other hand, inner-city occupants have a whole different set of considerations when it comes to heating and hot-water solutions. In urban areas, Rinnai advises using hybrid designs, such as hydrogen-ready units capable of accommodating gas blends up to 20%. By considering the specific requirements of each location and application, Rinnai ensures that customers can maximise efficiency and minimise costs.

To illustrate the level of customisation available, Rinnai considers a hypothetical scenario where a customer owns an urban retirement community consisting of three Edwardian houses, with a mixture of distinct heating and hot-water requirements. In this case, Rinnai can design and install a comprehensive system that guarantees maximum output, minimises fuel and operational costs, and takes into account the feasibility of the solution from a building and budget perspective.

"We believe implicitly in this basic premise – we do the best we can, and we achieve what our customers want and expect"

Rinnai not only advises customers on the most suitable system for their needs, but also designs a heating and hot-water system that complements the customer's site in a unique way. Whether it's an off-grid rural location or an urban dwelling, Rinnai offers the expertise and solutions needed to reduce costs and carbon emissions effectively.

Chris Goggin, operations director, emphasises the company's commitment to providing the highest-quality products and exceptional service. 'We have positioned the Rinnai name as a company that offers the highest-quality product and best available value, with service excellence. It is a position of responsibility, and we have maintained a stance of doing the absolute best we can for customers,' he said.

'We believe implicitly in this basic premise – we do the best we can, and we achieve what our customers want and expect. That includes anticipating the future.'

Rinnai said it is proud to be a manufacturer of proven excellence, using its core competencies in design engineering to deliver solutions that meet the evolving needs of customers and the market.

Its commitment to sustainability extends beyond providing customised solutions. The company offers a range of decarbonising and cost-reducing energy options suitable for all types of properties. Whether it's heat pumps, BioLPG, solar or hydrogen, Rinnai aims to meet the energy demands of residential and commercial properties.

The introduction of Rinnai's new design service marks a significant milestone in its H3 range of products. It not only reduces costs for customers, but also provides detailed information that ensures the correct decisions are made regarding system design and installation. Rinnai understands that well-informed decisions are critical to achieving the desired outcomes, and this service initiative aims to empower customers with the knowledge necessary to make those decisions confidently.

Rinnai's dedication to designing and delivering high-quality, customised heating and hot-water solutions positions it as a leading provider in the market, ensuring that customers receive the most efficient and cost-effective systems, tailored to their individual property requirements.

To acquire this complimentary service, interested customers can simply email Rinnai's team of experts, who will promptly assist them in designing a heating and hot-water system specific to their requirements.

Visit www.rinnai-uk.co.uk

Products of the month

Rinnai supplies hot water and heating system to luxury London development

Hybrid system provides practical and economic technical solution at complex in the city

Rinnai has delivered its Hybrid H2 system to a new luxury complex in the heart of the Farringdon district of London. The heating and hot-water solution combines a low global warming potential (GWP) 55kW heat pump, bespoke thermal stores, plate heat exchangers, and 10 cascaded I2HY20 hydrogen-ready continuous flow water heaters. The comprehensive system was supplied in one consignment, ready for installation at the multimillion-pound development.

The luxury complex, which encompasses a new hotel, contemporary office space and affordable housing units, required a versatile and efficient design to meet the diverse demands of the site. The multipurpose use of the site meant only a fit-for-purpose design would satisfy the practicalities and nuances of space, and ensure demand and energy usage are met 24/7.

Rinnai's solution was tailored to ensure continuous hot-water supply, while addressing the site's decarbonisation goals. The system incorporates a hybrid approach, with a heat pump, plate heat exchangers, thermal stores, and hydrogen-ready water heaters.

The historical significance of the site adds to the project's uniqueness. The development pays homage to its heritage as a Victorian-era schoolhouse for impoverished children, known as a 'ragged school'. Retaining many original features, the building provides a blend of modern amenities with a nod to the past.

The site is very complex and still retains many original features from the Victorian era. 'We conducted a thorough site survey, considering capital and operational expenditure, as well as carbon modelling,' Darren Woodward, spokesperson for Rinnai, explained. 'Our hybrid system was delivered as a complete package. We believe this type of solution represents the future for larger retrofit projects in London and other cities, combining practicality, cost-effectiveness, and reduced carbon footprint without compromising performance.'

Rinnai's Hybrid H3 decarbonisation range offers a wide selection of products suitable for commercial, domestic and off-grid heating and hot-water delivery. The H3 series includes hydrogen and BioLPG-ready technology, hybrid systems, low-GWP heat pumps, and solar thermal options. Rinnai's continuous flow water heaters, part of the H3 range, are designed for durability, energy efficiency, and customer satisfaction.

"As the demand for decarbonisation solutions grows, Rinnai's H3 range offers diverse options to meet heating and hot-water needs"

The H1 series focuses on hydrogen as a future clean energy source, with Rinnai's water heaters ready for 20% hydrogen blends and featuring the world's first 100% hydrogen-ready hot-water heating technology. The H2 series simplifies decarbonisation through renewable gas-ready units, solar thermal systems, and heat pump hybrids. Finally, the H3 series offers low-GWP heat pump technology in a range of capacities suitable for residential and commercial applications.

Rinnai produces more than two million units annually and operates across five continents. Its products are renowned for high performance, cost efficiency, and extended working lives. Rinnai's commercial and domestic water heaters provide a constant supply of temperature-controlled hot water and can operate on a variety of energy sources, including hydrogen blends, LPG, BioLPG, and rDME for off-grid customers.

All Rinnai products are UKCA certified and offer A-rated water efficiency. They can be purchased online 24/7, with next-day delivery available across the UK. Rinnai also provides comprehensive support services, including carbon and cost-comparison calculations, system design recommendations, training courses, and technical assistance.

With the successful implementation of Rinnai's Hybrid H2 system at the luxury complex in Farringdon, the project showcases the practicality, economics, and technical feasibility of integrating advanced heating and hot-water solutions.

By combining a low-GWP heat pump, bespoke thermal stores, plate heat exchangers, and hydrogen-ready water heaters, the system ensures a reliable and efficient supply of hot water, while significantly reducing carbon emissions.

The seamless integration of modern technology with the historical context of the site demonstrates Rinnai's commitment to innovation and sustainability. As the demand for decarbonisation solutions grows, Rinnai's H3 range offers diverse options to meet the heating and hot water needs of residential and commercial properties.

With its extensive expertise and global presence, Rinnai continues to lead the way in providing practical, economic and technical solutions for a greener future.

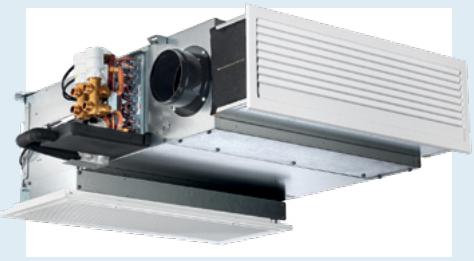
For more information about Rinnai's products and services, visit its website or access the 'Help Me Choose' webpage for personalised guidance.

Visit www.rinnai-uk.co.uk

Products of the month

Carrier announces new hybrid hydronic unit

Next-generation unit, designed for hotels and hospitality venues, offers high indoor air quality and quiet performance



A new hybrid hydronic terminal unit, the IdroFan 36XH, has been introduced by Carrier. Specifically designed to meet the unique requirements of hotels and hospitality venues, this solution offers exceptional guest benefits, including high indoor air quality, excellent comfort and quiet performance, thanks to its induction ventilation and variable-speed fans.

The IdroFan 36XH offers efficiency and flexibility, providing a standalone unit that ensures stable and comfortable conditions for guests, while delivering energy-efficient operation and reduced running costs for building owners. When connected to a high-performance Carrier air handling unit, the IdroFan 36XH enhances indoor air quality by delivering filtered and conditioned fresh air to the space. To further prioritise indoor air quality and occupant wellbeing, an optional integrated carbon dioxide sensor can be added to the terminal unit.

'Spaces with intermittent occupancy present unique challenges for effective air conditioning and ventilation,' explained Alexandra Chanu, product manager, Europe. 'Carrier's next-generation IdroFan 36XH hydronic hybrid terminal is specifically designed to address the distinctive requirements of this segment. It combines thermal responsiveness, energy efficiency and guest comfort in a cost-effective package.'

The design of the unit combines the efficiency of air induction ventilation with the high heating and cooling capacity of a fan coil. The range includes three unit sizes, available in two-pipe or four-pipe configurations, with capacities of up to 8.79kW for heating and 4.7kW for cooling. The unit offers three operating modes – Eco/Quiet, Comfort/Quiet, and Active Fan/Boost – to cater for the varying needs of intermittently occupied rooms. These modes ensure optimal comfort for guests while minimising operating costs.

The provision of a high level of fresh air renewal promotes restful sleep and supports guest wellbeing. When outdoor conditions are also favourable, the system can use free cooling, further enhancing energy efficiency during cooling mode and night-time operation.

The IdroFan 36XH is backed by a certified Product Environmental Profile, making it a valuable asset for building sustainability assessments and certifications such as Breeam and Leed. Its compact design allows for easy positioning on site, and quick access during installation, commissioning and maintenance.

Visit www.carrier.com

Elco appoints new area sales manager for East Anglia ›

Andy Madden has joined Elco Heating Solutions as the area sales manager for East Anglia. Having worked in the commercial heating and hot-water sector since 2008, he brings a wealth of experience to the role. His responsibilities will include strengthening key relationships with consultants and contractors in the commercial heating sector.

'I'm looking to forward to selling Elco's excellent range of heating products in the East Anglia area, not to mention raising the company's profile,' Madden said. 'These are exciting times for our industry.'

Visit www.elco.co.uk

Pump Technology's David Johnson joins SoPHE committee ›

Pump Technology's marketing and business development manager, David Johnson, has just joined the Society of Public Health Engineers' (SoPHE's) IWG committee.

Johnson says he is looking forward to supporting SoPHE and its public health members, and will be assisting the committee with the organisation of this year's London Annual Dinner.

Last year, Pump Technology was the first company to sponsor the SoPHE Young Engineers Award.

Pump Technology specialises in wastewater and sewage pumping solutions, and is the largest Jung Pumpen authorised distributor in the UK.

Call 0118 9821 555

Visit www.jung-pumps.co.uk

Aquatech Pressmain introduces failsafe actuator valve for fire safety

Aquatech Pressmain has launched its firesafe actuator valve.

Designed to enhance fire-safety measures, the valve features a break tank, low-water level interface that automatically shuts down the cold-water supply. This isolates the flow of water to the domestic riser, enabling the booster set to pump all the available water to the sprinkler riser.

The valve displays status and alarm messages, auto shuts down at tank low level of water, has a failsafe actuator, and keeps the pipework water cool.

Call 0333 5775121

Luceco lighting installed at Qatar Central Bank refurbishment

Luceco has supplied luminaires to the Qatar Central Bank, located in West Bay, Doha. The 30-storey building required a completely new lighting solution that would achieve energy efficiency and cost-effectiveness.

The refurbishment project was tendered under the supervision of the Arab Engineering Bureau. Luceco's lighting design solution showcases attractive return-on-investment (ROI) calculations, providing energy-efficient luminaires that also enhance the overall lighting environment of the bank.

To replace the existing 4 x 18W conventional 600 x 600 fixtures, Luceco supplied more than 3,800 recessed LuxPanel luminaires. Additionally, Platinum, FType and Element downlighters were strategically installed throughout the building to provide optimal illumination. In service areas, externally, linear IP65 Climate weatherproof luminaires were used.

A well-designed LED lighting scheme can offer substantial energy savings and cost-effective operation, and allow the end client to build ROI calculations into the business plan. Luceco's team of qualified lighting engineers can provide detailed project ROI calculations alongside its lighting design service.

Call + 44(0)1952 238 100

EnviroVent expands its ventilation range

EnviroVent has introduced a Passivhaus-certified mechanical ventilation with heat recovery range, Sabik 350 and 500. Designed for new and refurbished homes, the systems offer balanced and sustainable ventilation with modular features and user-friendly controllability.

They allow flexible ducting configurations and include features such as humidity sensors and touchscreen controllers. The Sabik 350 unit is Passivhaus certified when equipped with a preheater and enhanced ePM1 70% filter.

Call 0845 27 27 810 or visit www.envirovent.com

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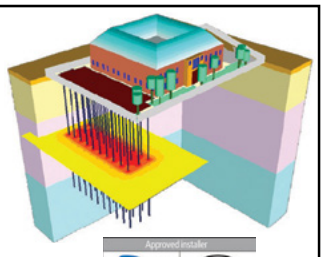

Certificate Number MCS 1201
Heat Pumps

Fire Protection

Alex Shan

Building connections

CIBSE ANZ Young Engineer of the Year Alex Shan explains the importance of communal spaces and why data is key to enhancing future buildings

A compelling video presentation on the importance of communal spaces in buildings won Alex Shan the Jack Pirie Award for Young Engineer of the Year at the CIBSE ANZ Young Engineer Awards 2022. Since his win, Shan – who was a senior mechanical engineer at Cundall – has moved to proptech start-up CIM, which is using data to target carbon emissions from buildings. He explains why communal spaces are crucial, and how taking a data-centric approach will enhance our future buildings.

What inspired your focus on communal spaces?

I believe face-to-face social interaction is essential for our wellbeing. In an increasingly technologically driven world, it is vital to recognise the growing need for physical spaces that foster genuine human connections. By focusing on the development of these spaces, we have the power to cultivate healthier, more vibrant communities.

Community buildings should be centred on inclusivity, experience and adaptability, achieved through thoughtful design and a user-centric approach that incorporates universal design principles to ensure accessibility for everyone.

What changes will have an impact on building design?

Change will be driven by a combination of factors, including rapid technological advancements, evolving societal needs, and environment. As technology continues to develop at an unprecedented pace, new innovations and discoveries will influence the way we live and work, and how our spaces are used.

This presents challenges for designing and maintaining buildings, to keep up with these changes in order to remain functional. Designing adaptable buildings requires a forward-thinking approach, incorporating modular design principles for flexible infrastructure that can easily accommodate future modifications. This includes the integration of smart systems that can be upgraded or replaced as advancements emerge.

We need more awareness of the available technologies and to challenge the traditional way of designing, maintaining and operating buildings, such as fault detection and diagnosis (FDD), digital twins, and the adoption of open data standards and interoperable systems – all trends that support the advancement of our industry. Recent developments in artificial intelligence (AI) will make their way into buildings soon. This comes in many forms – for example, we are already using AI to identify the different equipment connected to a building so we can monitor it correctly.

What will be the impact of increased automation?

Increases in automation and productivity may lead to more free time and the need to socialise with people in settings other than work. Further, many spaces are experiencing reduced use, which means more assets that are not producing value. This presents an opportunity for young engineers to identify these changing trends and design systems that are flexible enough to accommodate different purposes and able to operate effectively during periods of low occupancy.

How can data enhance future buildings?

A ton of data in buildings is not used. By leveraging this, we can optimise buildings and improve the comfort and wellbeing of occupants. Data-driven systems with FDD solutions enable predictive maintenance, allowing facility teams to locate and fix issues before they escalate. At my company, we have built a platform for operation teams to quickly locate and fix equipment failures within their buildings.

By continuously monitoring building systems – and collecting data on performance, energy consumption, and equipment health – facility managers can identify areas for improvement. This approach optimises the lifespan of equipment, reduces energy waste, enhances system efficiency and saves time .

We need to stay curious about advancements in other fields, facilitate knowledge sharing and encourage collaboration between engineers, architects and data experts. There needs to be a cultural shift towards embracing innovation and challenging the traditional ways of designing and operating our buildings.

EVENTS AND TRAINING

NATIONAL EVENTS AND CONFERENCES

Environmental engineering masterclass: 40 years of moving the dial
4 July, Aecom, London
In this CIBSE Fellows network event, Patrick Bellew, FREng FCIBSE, founder and chairman of Atelier Ten, will describe the people and things that have influenced him, and how he has dealt with innovation and risk. He will also talk about the development of the language and communication of environmental design that is the hallmark of Atelier Ten.

CIBSE Young Engineers Awards
12 October, Royal College of Physicians, London
The awards recognise the innovative thinking, hard work and skills of those new to the industry, and showcase the employers who are committed to developing and encouraging young talent.
www.cibse.org/yea

Façade 2023 Design and Engineering Awards
8 November, London Hilton, Park Lane
For the second year, the Society of Façade Engineering (SFE) and CIBSE have joined forces with Zak to co-locate the SFE Façade Awards and Dinner with the Zak World of Façades conference. The awards recognise and reward excellence and achievements in façade engineering, raising the profile of this discipline.
www.cibse.org/what-s-on/facade-2023-design-and-engineering-awards

CIBSE REGIONS AND GROUP EVENTS

Check the website for up-to-date information on regions and groups meetings, webinars and podcasts. Visit **www.cibse.org/events**

West Midlands: Carbon steel tube – basics
4 July, online
An introduction to Tata Steel, its products and its sustainability focus.

SLL: The path to sustainable lighting
15 August
Learn how to recognise and quantify the circularity of lighting products, and how to increase their service life. The presentation will take a deep dive into metrics used to quantify the environmental impact of luminaires.

West Midlands: Carbon steel tubes – intermediate knowledge
26 September, online
Tube specifications and tube manufacturing methods, with an introduction to galvanic corrosion, and installation and commissioning issues. With speaker, Dr Chris Owen, Tata Steel UK.

Australia and New Zealand (ANZ): CIBSE ANZ Young Engineers Awards
26 October, Melbourne
The winners of the three ANZ Young Engineers Awards – Student, Graduate and Young Engineer of the Year – will be announced.

West Midlands: Reflection on the regulation – BR AD 0
14 November, online
Roundtable discussion, bringing together experts in the assessment of overheating, and perspectives from a ventilation/cooling supplier and lead designer for a property developer.

YEN West Midlands: Water treatment masterclass
16 November, online
A full day of CPDs covering the understanding of water quality, scale control, bacteria and legionella control, filtration and reverse osmosis.

On-demand training

CIBSE has a portfolio of on-demand courses, which contain interactive online content, with quizzes and additional resources, to support your learning. Visit **go.cibse.org/training-mycibselearning**

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CIBSE JOURNAL PODCASTS

The latest *CIBSE Journal* podcast, sponsored by Lutron and titled 'People, energy and performance: a new approach to office lighting', is now available. The podcast features the Lighting Industry Association's Bob Bohannon, Hoare Lea's Juan Ferrari and Lutron's Miguel Aguado. Listen on Apple and Spotify or on CIBSE's SoundCloud at **bit.ly/CJMay23PC1**

MEMBERSHIP WEBINARS

4 and 11 July

CIBSE Membership hosts free, two-part webinar series to support members with applications for the Associate and Member grades and registration with the Engineering Council at Incorporated Engineer and Chartered Engineer level.

To register for this and all other membership webinars, visit: **bit.ly/CJMemWeb**

CIBSE JOURNAL WEBINARS

The next *CIBSE Journal* webinar will take place on 11 July. Sponsored by Airflow, it is titled 'Understanding MVHR for commercial buildings' and will discuss the importance of ventilation, and why ventilation with heat recovery is an ideal solution for commercial buildings.

The June webinar is now available on demand. Register for all webinars at **www.cibsejournal.com/webinars**

TRAINING COURSES

CIBSE's courses are run as in-person and live online training. Corporate delivery is also available in-house, face to face, or remotely, online. Courses are finalised two weeks before the training.
See all upcoming courses at **www.cibse.org/training**

Low carbon consultant building design
13-14 July, Balham, London
14-15 September, London

Low carbon consultant building operations
13-14 July, remote

Below-ground building drainage
14 July, Balham, London

Overview of IET wiring regulations (18th edition)
17 July, remote
5 September, remote

Low and zero carbon energy technologies
18 July, remote

Energy Savings Opportunity Scheme (ESOS)
18 July, remote

Fire safety building regulations: Part B
20 July, Balham, London

Building services explained
24-26 July, Balham, London
12-14 September, London

ISO 50001:2018 Energy Management System
25-26 July, Balham, London

Energy efficiency-related building regulations: Part L
27 July, remote
14 September, remote

Electrical services explained
1-3 August, remote

Emergency lighting to comply with fire safety requirements
11 September | remote

Mechanical services explained
12-14 September | London

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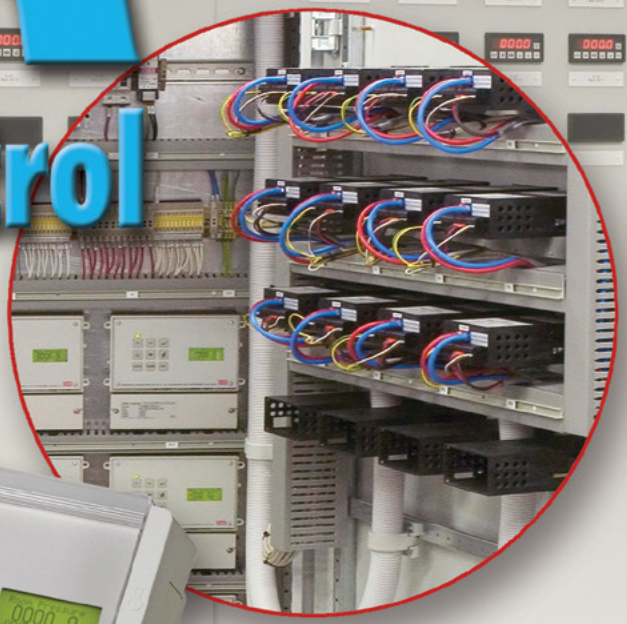

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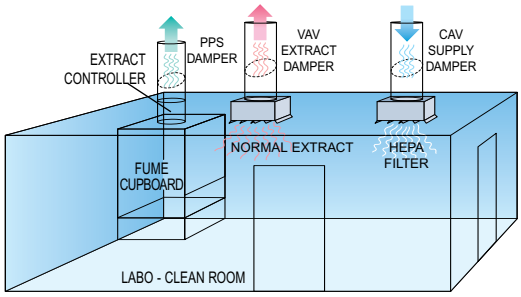

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